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THE CONFERENCE PAPERS.

No. 5. Sterility.

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Sterility of domesticated animals is rapidly becoming a subject of supreme importance, alike to the veterinary surgeon and the stockbreeder. This condition of affairs may have been brought about by one, or both, of two factors.

There has, during the post-war period, been a distinct increase in the amount of attention given to the breeding of pedigree stock by stockowners, and it is during this period that a vast amount of clinical *data* and reasoning has been published in English Literature, by W. L. Williams, of Cornell University, New York. The publication of this author's "The Diseases of the Genitals" has opened up a new field for veterinary endeavour, and, in the present writer's experience, has brought hope of handling herds, in which, previous to a perusal of Williams' work, no progress was being made.

Frequent references to the failure to reproduce are made in certain sections of the Press, and early in the year extracts from the *Racing Calendar* were given, showing the number of live foals following a certain number of services by fashionable thoroughbred sires. The percentage of live foals following services by "The Tetrarch" is arresting.

It would be extremely instructive and interesting to know what pathological lesions were operative to produce such disastrous results, both for the owner of the sire, the owners of the mares, and, in a larger measure, for the thoroughbred stock of this country.

Sterility may be defined as the failure to bring forth live healthy progeny when given an opportunity so to do. The female or the male may be the delinquent, but the result is the same, although each calls for separate handling. Alternatively, it may be stated that sexually healthy animals will normally and physiologically reproduce their kind. This view of sterility is very wide, and necessarily includes any interference with conception, and, after that has taken place, any interference with the well-being of the fœtus. It follows that abortion is only a phase of sterility.

Bovine sterility is here taken as a type, primarily because the writer's experience of sterility in this species is greater. Other considerations are, that subjects are more frequent and call for a more skilled handling. Also, breeding takes place at any and every period of the year.

The causes of sterility are varied and extensive, and it is obviously beyond the scope of this paper to deal properly with all of them.

Briefly stated, the causes may be divided into:—

1.—Natural.

2.—Acquired.

Natural causes would include malformations, which are nearly always incapable of rectification. Acquired causes would include new growths and tumours; general infections such as actinomycosis and tuberculosis of the genitals; and lastly and most important, the infections of the genitals, these to include the specific venereal diseases. This latter group are by far the most frequently met with, and it would be as well at this stage to propound the theory of W. L. Williams, because it has a distinct bearing upon the relative frequency of infection of the genitals with micro-organisms.

The genital organs of bovines, male and female, in common with other tissues and glands that have an opening to the exterior, are liable to infection with bacteria. It would be extraordinary if it were otherwise. These micro-organisms may gain entrance to the genital canal in one of three ways.

1. They may be carried by the blood stream and the lymphatic system, which is highly developed in this region.

2. They may be introduced during or subsequent to parturition in the female.

3. They may be deposited by the bull at the time of copulation, and conversely the bull may be infected by an infective cow at the time of copulation.

The importance of the manner of their introduction will be dealt with later, but, once introduced, they may be capable of producing a variety of pathological lesions according to the variety of organism gaining access. These pathological lesions are the direct cause of the failure of conception to take place. Granted that bacteria have access, they may give rise to a series of observed events, which events seem to continue in a cycle.

The Cycle of Womb Infection.

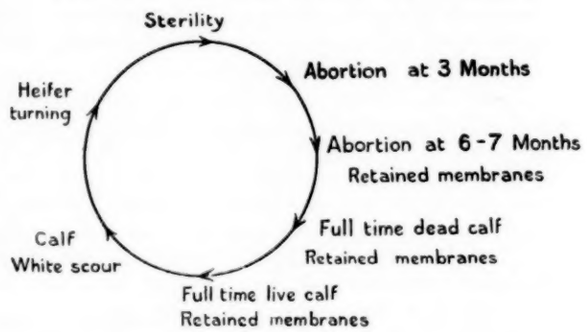
The infection may be very virulent and of itself be capable of destroying the spermatoza on their way to the *osteum abdominale* and the fallopian tube. If the infection is not sufficiently virulent to prevent conception taking place (that is, death of the spermatozoon does not occur), then the fecundated ovum descends the oviduct to the already infected uterus and is there subjected to a precarious existence. Should early death of this fœtus take place, it will be expelled and an abortion will have occurred, although the actual phenomenon may have passed unobserved. Such an abortion, exactly three months after service, is shown amongst the pathological specimens. Apparently more frequently, because more easily and readily observed, the dead fœtus is expelled at six or seven months. Less often, the fœtus is carried to its full time, but is born dead, and the placental membranes are retained by the mother. A less virulent stage may be the birth of a live calf with maternal retention of the placentæ. This calf, although born alive, a few days after birth may develop white scour, due to the presence in the intestinal canal of organisms swallowed during the intra-uterine period. Should the calf survive this intestinal attack, complete recovery may occur, but more often the organisms remain within the calf and are carried by the blood stream to their predilection seat in the genital organs. When, in the case of a female calf, she reaches sexual maturity, great difficulty is experienced in getting her to hold to the bull; in other words, the heifer turns and is sterile, thus completing the cycle (see diagram). In the case of a bull calf reaching sexual maturity, he may emit, along with his semen, these micro-organisms, rendering his services sterile, with the added importance of probably infecting a previously healthy female. During the last four years such a cycle of events has been observed amongst herds. Statistics, when the investigator has not complete control, are difficult to obtain after a certain period, and particularly does the final phase—that of a heifer turning when reaching sexual maturity, and with a previous history of white scour as a calf, require careful observation over a prolonged period.

So far, in dealing with this cycle of womb infection, only a passing reference has been made to the pathological lesions that may and do result. Rather have we considered the observed effects of the pathological lesions caused by these various bacteria. A proper understanding of sterility can only be obtained by the recognition of these lesions, and, further than that, an accurate knowledge of the anatomy and physiology of the genitals is essential before one can proceed to even a clinical examination, upon which this recognition is based. The anatomy of the male and female organs is capable of a more or less exact conception and will not be here considered. The physiological functions of oestrum and pregnancy can with advantage be dealt with in more detail.

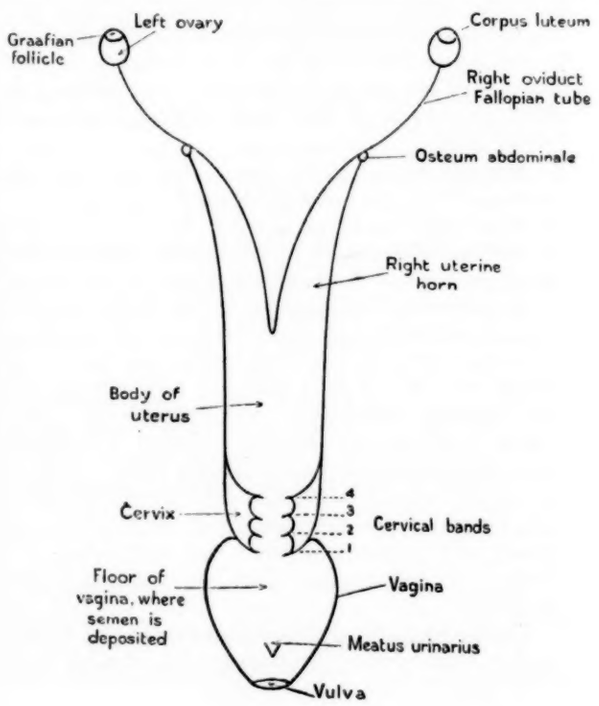
Oestrum.

Oestrum is recognised in the cow by the desire for copulation and is manifested by her standing to be mounted by her companions. The presence of a ripe ovisac can be definitely ascertained in one or other ovary at this stage by rectal palpation. At this period the cow usually exhibits some excitability, as bellowing; the lips of the vulva are swollen, and, in the early stages of oestrum, a glycerine-like discharge of mucous is observed. Should copulation occur, the spermatozoon travels through the cervix, the body of the uterus, and the uterine horn to gain the oviduct. Subsequently the ripe ovisac ruptures and fecundation occurs. If this series of events has taken place, oestrum finishes, and the cow resumes her normal behaviour and appearance. If conception has not occurred, the engorged blood vessels of the *endometrium* cause a bloody discharge into the body of the uterus and this eventually gains exit through the cervix and the vulva. Independent of conception,

The Vicious Cycle of Womb Infection.



Diagrammatic Schema of Female Genitalia (Bovine)



the ruptured Graafian follicle with the hæmorrhagic debris and the surrounding cells now form the yellow body or *corpus luteum*. If conception has not resulted, this *corpus luteum* of oestrum disappears before the next oestrum, which usually occurs normally in twenty-one days. If there has been conception, this *corpus luteum* persists throughout the whole of the pregnant period and for a varying period subsequent to parturition.

Pregnancy.

After fertilisation the fecundated ovum migrates along the fallopian tube to the uterus, this migration occupying probably eight to fifteen days. When it reaches the uterus it has already undergone segmentation and is now an unattached body, but dependent upon the nutrient fluids of the *endometrium* for its existence. Should the uterus be infected, this unprotected morula is easy prey for virulent organisms.

> There is constant peril to the embryo from bacteria already old inhabitants of the utero-cervical cavity, and there is a further threat of unknown potentiality from micro-organisms floating in the blood of the mother, which may invade the uterus from the blood stream.—*W. L. Williams.*

The cervical seal now effectually closes the cervical canal. The placental membranes begin to form, first the amnion and then the allantois, and the fusion of these in ruminants forms the chorion. The uterine mucosa begins to develop. It becomes vascular and the cotyledons develop placental areas. The fœtal membranes expand into every available space of the uterus. The tips of the allantois may become necrotic, as shown in the specimen. There is poured out into the amniotic sac, fluid which acts as a buffer to the developing fœtus during the whole of its intra-uterine period. The fœtal placental tufts formed on the allantois, dovetail into the crypts on the cotyledons, and these two epithelial layers in close juxtaposition constitute the placental filter, through which the fœtus derives its nourishment, and discharges its waste material. It is a moot point whether bacteria are ever able to pass this filter. Williams says, *Diseases of the Genitals*, p. 69 :—

> Hence in the placental area, so long as the structures are healthy, so far as is known, infection cannot pass from the mother to the fœtus through the placental filter, nor can infection invade the fœtus from the uterine cavity by passing between the two fœtal structures, and thence gain the fœtal circulation, without having first attacked and severely damaged the placental structures themselves.

But we have already noted the possibility of the presence of organisms in the utero-chorionic space and these may invade the chorion and reach the amniotic fluid, there to be swallowed by the fœtus. Should these organisms invade the placental areas or tufts, a placentitis is set up with retention of the fœtal membranes subsequent to exit of the fœtus, dead or alive, from the uterine cavity.

Clinical Examination of the Female.

A clinical examination of the female genitals for pathological lesions that may lead to sterility, gives an indication of the extent of the disease processes, if any, and should reveal to the examiner whether or not the animal is pregnant. It is not always safe to rely upon the word of the owner or herdsman whether a certain animal is pregnant, even although there may be absence of oestrum for more than twenty-one days.

When about to examine an animal, it has been found a good plan to have the contents of the abdominal viscera as low as possible. This can be accomplished by fasting overnight and greatly facilitates the handling. It is also essential that some previous history should be furnished with regard to the regularity or otherwise of the oestral periods and the number of copulations she has received. This history in the herds examined has been most difficult to obtain and not much reliance can be placed upon the information unless such events are definitely placed on record, in writing, immediately they have been observed. Stockowners are notoriously neglectful of these essential details. Some suitable well-lighted box or standing is selected and the animal gently, but securely held. The hand, with nails well trimmed is introduced into the vulva and on into vagina until the *os uteri externum* is grasped. The presence or absence of the uterine seal is to be noted and, if absent, the size of the opening into the cervical canal. In the pregnant animal, the mucous discharge around the *os uteri externum* is glutinous and sticky in contradistinction to the glycerine-like condition of the mucoid discharge in the non-pregnant cow. Mechanics describe the one condition found in pregnancy, as "tacky." Any abnormalities of the surface are revealed to the touch. If the pregnancy is advanced, the fœtus may cause a protrusion to either one side of the *os* and is easily palpable. The closed vaginal speculum is introduced into the vulva with an upward trend to avoid entrance to the *meatus urinarius*. If the light is insufficient, a small electric torch introduced within the jaws of the open speculum affords a splendid view of the vagina, which in colour should be the pink of a wild rose. Careful visual examination will reveal the *os uteri* externum in the form of a rosette at the far end of the cavity. Any abnormality can be noted. The lining membrane of the vagina comes under purview, as also does that of the vulva. By this means the presence or absence of nodular venereal disease, widely distributed in most herds, can be easily recognised, as also may the vesicular venereal disease, less frequent, but causing much more immediate concern to the patient. A rectal examination follows and this needs to be carefully undertaken to avoid any damage to the inner surface of the rectum. When the hand has disappeared from view, palpating down will reveal the cervix, a cylindrically-shaped organ, and, passing forward, the body of the uterus may be felt. At its bifurcation into the cornua the operator moves the hand slightly to the left, and, following the outline of the cornu, the ovary may be grasped lying on the anterior border of the broad ligament of the uterus and within its folds. It is not always possible to determine

the outline of the fallopian tube, but an effort is always made to recognise it, for in advanced disease it is thickened and then easily felt and is indicative of salpingitis. The ovary is palpated for the presence or absence of the *corpus luteum* and for cysts. The *corpus luteum*, either of oestrum or pregnancy, is distinguished from a cystic Graafian follicle by its fleshy feeling as opposed to the tense projection of the cyst full of fluid under pressure. The broad ligament of the uterus is next distinguished and within its folds the uterine artery is revealed on account of its size, and, if held lightly, pulsation can be felt. Working forward to the ovary along the anterior border of the broad ligament, the tip of the cornu is again grasped and palpated, its size being mentally recorded, also the fluidity of its contents or otherwise. The hand is now withdrawn slightly until the bifurcation of the body of the uterus is reached again. An exactly similar manipulation is made of the right cornu, right ovary, fallopian tube, broad ligament and uterine artery. The size of each part is essentially noted.

A computation of this clinical examination and its findings is made along with the previous history of the animal. A diagnosis of pregnancy is based upon this computation and the following is used as a guide, although any one finding is not relied upon, rather the assembling of the evidence being necessary.

(1) The number of days since the last oestral period.
(2) The absence of blood after copulation.
(3) The presence of the cervical seal or the glutinous sticky discharge of mucus.
(4) The difference in size of the two cornua, and on palpation recognisable evidence of the fœtus or its attachments to the cotyledons.
(5) The pressure of the corpus luteum in the ovary corresponding to the larger horn.
(6) The enlargement of the uterine artery corresponding to the larger horn and the facility of its pulsation being felt.

A diagnosis as to pregnancy is always to be arrived at before fixing any forceps to the cervix. In some animals it has been necessary to grasp the outer band of the cervix with the uterine forceps, and, gently retracting, to pull the cervix and the genital canal more into the pelvic cavity. The vaginal speculum has been found a nuisance in the fixing of these forceps, therefore its use was early discarded. Lubricated with a little antiseptic jelly, the longer pair of forceps are passed into the vagina, and, with a finger in the cervical canal and the thumb on the outside of the cervix, the jaw with the one prong is introduced into the cervical canal and the jaws closed so that a firm grip of one side of the lip of the cervix is obtained. Slight traction is sufficient to retract the cervix a considerable distance. This pair of forceps is now given to an assistant to hold, whilst the shorter pair is affixed to the opposite side of the lip of the cervix in a similar manner. Gentle traction will bring the cervix into the vulva, when it can be examined. In a non-pregnant animal it is necessary to obtain entrance to the uterine cavity for the purpose of determining the presence of discharges. For this purpose the closed dilator is introduced into the *os uteri externum* so as just to enter, and no more, the uterine cavity. This proceeding requires care, for the disposition of the cervical mucosa at the point of the annular bands is such as to throw it into folds which project towards the *os uteri externum*. By gently rotating the dilator after the manner of a corkscrew and alternately withdrawing slightly and gently moving the dilator forward, the dilator can be distinctly felt to pass over these mucous folds. It has been found a good plan to count each of these obstacles as they are surmounted, and in this manner one can gauge the moment the point of the dilator is beyond the *os uteri internum*. So far, no dilation has taken place—a passage merely has been found through the cervical canal. On account of the backward projection of the annular folds, this is absolutely essential if no damage is to be inflicted upon the cervical mucosa. The screw in the dilator is revolved and the jaws made to open. The dilator is now withdrawn with a complete rotary movement so that these mucous folds are flattened from before backwards. The operation is repeated until it is possible to pass a small catheter through the cervical canal and to project slightly into the uterine cavity. If there is a large accumulation of pus, as in pyometra, there is an escape of this, and its consistency can be noted. More often, there is no outflow of fluid discharge, and in order to determine the nature of the uterine contents a rubber tube leading from an irrigator, with a head of weak iodine solution in warm water is attached to the return flow catheter, gravitation being sufficient to cause a steady flow through the catheter into the uterus. The first fluid to pass through the opening in the catheter for the return flow is examined for floccules of pus, indicative of catarrhal endometritis. It has been found that, once the cervix has retracted after calving, it is a very risky proceeding to introduce any other catheter than a return flow.

Pathology.

Naturally, these infections of the genitals produce pathological lesions; a recognition of these lesions in the various organs enables one to associate particular lesions with definite organisms. In the clinical examinations made during the last two years the following diseases have been encountered and handled as outlined.

Nodular Venereal Disease.—This chronic infection of the mucosa of the vulva and vagina appears to be widespread amongst females. It is characterised by small nodular elevations of the mucosa, about the size of a millet seed, sometimes associated with a slight muco-purulent discharge which adheres to the vulva tuft. The exact bacteriology of this condition has not been determined. This condition of the vulva and vagina is probably the cause of the so-called acidity of these mucous surfaces, and the facility with which it yields to antiseptic and saline irrigations probably accounts for the readiness of the uninformed to advise irrigations of bicarbonate of potash in solution as a sovereign remedy for sterility. Daily

irrigations with a weak solution of iodine cause a disappearance of the nodules and a change in the colour of the mucous membrane from yellowish brown to rosy pink. Bulls have frequently shown the same lesions of the mucous membrane of the penis and yield to irrigations with iodine solutions introduced by means of a rubber catheter.

Cervicitis is an inflammatory process of the mucous membrane of the cervical canal. It is widespread and has been recognised in virgin heifers as well as in cows of all ages. In most cases this inflammatory condition is brought about by infection with micro-organisms, and chief amongst these seems to be the *Streptococcus viridans*, although a great many other pathogenic organisms can conceivably reach this organ. The position of this canal being placed as it is, between the vagina and the uterus, renders it readily liable to injuries, either at copulation or parturition, and organisms can gain entrance through these broken surfaces. Bacteria may also be deposited in the vagina by the bull at copulation. In the case of virgin heifers the presence of cervicitis must be attributed to pre-natal infection of the alimentary tract through the normal physiological process of swallowing the amniotic fluid which is liable to contain bacteria. The reaction of the mucous membrane results in a swollen condition of the mucous folds, projecting as they do towards the vagina; the first fold makes its appearance in the lumen of the *os uteri externum*. Should the process be extensive, the lips of the opening are pushed outside and the second and third folds may be protruded. This condition does not appear to give rise to any material discomfort or interference with the general health in the majority of animals. A thin mucous discharge is sometimes observed. Should the animal become pregnant in spite of this condition, the cervical seal will be improperly formed and at the later stages of pregnancy a prolapse of this inflamed region occurs; more frequently in beef herds than in dairy herds, in our practice. The diagnosis of cervicitis is based upon the clinical examination when its presence is ocularly demonstrated. Treatment with strong solutions of iodine was at first attempted, but the results were not entirely satisfactory. A 10 per cent. solution of icthyol in glycerine, introduced by means of a cotton-wool swab on the dressing forceps before and after catheterisation, has given better results. This may be repeated daily, but in practice bi-weekly examinations and dressings are adopted. During this period all sexual connections are avoided and sexual excitement is prevented. The extension of cervicitis results in an infection of the mucous membrane of the uterus and may there give rise to a more serious condition—endometritis.

Endometritis is an inflammatory condition of the lining membrane of the uterus, due to infection with micro-organisms. Endometritis has been in existence longer than abortion, if we understand the latter term to mean the expulsion of the fœtus before the termination of its normal intra-uterine period of two hundred and eighty days. Endometritis may occur in the non-gravid as well as the gravid uterus of cows. A variety of bacteria have been associated with this condition, chief amongst which are the *Bacillus abortus* of Bang, the *Bacillus pyogenes* and *Streptococci*. According to the previously expressed theory of womb infection, any organism found within the alimentary canal of the fœtus at birth, no matter if that birth occur at 80 days, 280 days, or any intervening period, had its previous site in or on the *endometrium*. The finding of any organism in or on any mucous membrane is not accepted by scientists as sufficient proof that that particular organism is the specific cause of the pathological lesions found, or the observed sequelæ to the presence of the pathological lesions. Yet it was, and still is, almost universally accepted amongst veterinary surgeons that the *Bacillus abortus* of Bang is the cause of the expulsion of a fœtus, should that expulsion occur prematurely. In other words, "The *Bacillus abortus* of Bang is the cause of the abortion." It would be as well to quote a pre-eminent bacteriologist, Sir Ray Lankester, on bacteria as disease-causing agencies.

> To prove the agency of a particular bacterium as *the* cause of a disease, it is accepted by bacteriologists as necessary to obtain in the first place a pure culture of the suspected bacterium and then to inoculate with it a perfectly healthy animal previously free from it. Then, if the bacterium is found to multiply and flourish in the inoculated animal and the symptoms of the disease supposed to be caused by the bacterium appear in the animal, the conclusion that the bacterium is the cause or agent of the disease is rendered highly probable. But this is not finally accepted until it has been confirmed by many trials under varying test conditions."

The above is a free rendering of Koch's postulates, which carry the matter a little further—*i.e.*, the bacterium must be recovered, in pure culture, from the diseased tissues of the inoculated animal.

Williams, in *The Diseases of the Genitals of the Domestic Animals*, states:—

> There are two essential factors in the causation of abortion. The infection must destroy the life of the fœtus (asphyxia or inanition due to placentitis or sepsis due to bacterial invasion of the fœtus) and must arouse such an irritation of the uterus (localised metritis at the cervical end) as to cause it to contract and expel its contents.

Hutyra and Marek state:—

> Under the term infectious abortion is included those cases which occur in otherwise healthy mothers as a result of external infection, producing inflammatory lesions of the uterine mucous membrane.

According to these authorities, the main cause of the expulsion of the fœtus in abortion is an inflammatory lesion of the mucous membrane of the uterus, or more tersely, cervical endometritis. This cervical endometritis, then, is the main pathological lesion in abortion. Therefore it should be absolutely essential that Koch's postulates must be complied with in the case of any organism such as the *Bacillus abortus* of Bang. I can find no authentic and reliable experiments that would comply with these postulates. Bang first found the *Bacillus abortus* in such an

endometritis. Had he accepted this endometritis as the pathological lesion causing the expulsion of the "fœtal cadaver," and not the act of expulsion as the pathological lesion, and put this organism to the acid test of Koch's postulates, the history of the control of abortion in England, and its mother subject, sterility, would have been very different during the last twenty years. Consequently, in discussing the etiology of endometritis, and its sequel, sterility (or abortion), scientifically we can go no further than to say that the *Bacillus* abortus, in company with many other organisms, may be a cause of endometritis. It has to be conceded that any organism capable of producing a cervical endometritis is a possible cause of abortion. These organisms, capable of producing an endometritis, may be carried to the *endometrium* by the blood stream or the lymphthatic system. Copulation with a bull whose genitals show pathological lesions and whose semen contains organisms is the most direct method of infection. The bacteria are deposited in the vagina and gain entrance to the uterus either by extension through the cervical canal or by being carried by the lymphatics. Pathologically these organisms may invade the mucous membrane of the uterus and give rise to a catarrhal condition of the cells of this membrane, characterised by a mucoid discharge into the uterus. Recovery from this condition may, and often does, take place without any permanent lesions of the endometrium. If recovery does not take place with or without the assistance of medication, this mucoid discharge may be replaced by pus cells, and the deeper seated muscular and serous coats may become involved with definite and degenerative changes in the mucous lining. The process of "*ectodermoisering*" takes place—*i.e.*, the columnular cells of the *endometrium* are replaced by stratified ectodermal cells (Wall). In the non-gravid uterus endometritis is characterised by the appearance in the cervical canal of this mucoid or purulent discharge, which may overflow into the vagina. Catheterisation will reveal the discharge in the first return flow. In the gravid uterus, endometritis may give rise to a placentitis, fœtal infection, abortion and retained placentæ. Treatment consists of the bi-weekly irrigation of the uterine cavity with two per cent. Lugol's solution in water. A B.I.P.P. suspension is introduced after each irrigation and the treatment is continued until the return flow shows no sign of discharge. Prevention can be accomplished by a close clinical examination of the sexual organs of the bull and ensuring that only healthy sires are permitted to copulate with healthy females.

Pyometra.—The term pyometra is usually applied to the accumulation of a large volume of pus in the uterus and may occur following abortion and retained fœtal membranes. A variety of organisms appear to be responsible for the pus. These organisms may be already present, as in endometritis, and the partial closing of the cervical canal causes a retention of the pus in either horn. There is usually an escape of yellowish white pus into the vagina and this may be voided when the animal is in a recumbent position. Oestrum is absent and a careful examination for pregnancy is necessary before catheterisation. This catheterisation is best carried out with the forceps fixed to the cervix and the latter well drawn back. Irrigation is performed until the whole of the contents of the uterus have been evacuated. Complete regeneration of the mucous membrane can be effected in some cases; others, of old standing, where the deeper layers are effected, become hopelessly sterile. The *corpus luteum*, when present, is dislodged. In our hands this has not been attended with any material effect.

Salpingitis.—When the infection spreads from the uterus to the fallopian tubes, salpingitis may result. The inaccessibility of these tubes frustrates any attempt at treatment, and, when double-sided salpingitis is diagnosed the animal must be classed as hopelessly sterile as far as our present knowledge is concerned.

Diseases of the Ovaries.

Cystic disease of the ovaries and the *corpus luteum* have been frequently encountered. It would appear that these cysts are the result of infection, either of the womb or of the ovaries themselves, but further work is required to establish the connection. These cysts, when found, are ruptured.

The Bull.

There can be no doubt that the bull in a herd plays an important rôle in the question of sterility, and no attempt at the control of the diseases causing that can be complete without knowledge of his reproductive organs and the bacteriology of these diseases. When dealing with womb infection, it was pointed out that the fœtus, in its pre-natal life, swallowed the amniotic fluid as a normal physiological process. It has been made abundantly clear that this amniotic fluid may, and does, contain organisms. These bacteria, if not sufficiently virulent to produce death of the fœtus and a cervical endometritis and consequent abortion, will accompany the calf, be that calf a heifer or a bull, into its post-natal existence. This bull calf may or may not break down with calf scour. From the nature of bacterial infections, it is not essential that scour should be in evidence to prove the infection of the alimentary tract of the calf with organisms that are capable of producing lesions in the genital organs. These organisms can be recovered from the alimentary tract immediately after birth. Should the bull calf recover from the scour, or escape its effects altogether, on reaching sexual maturity he may be found to have pathological lesions of the genitals associated with organisms of a similar type. These, in turn, are emitted with the semen and deposited in the vagina of the cow, there to give rise, as already outlined, to pathological lesions of the female genitals and consequent sterility of the female. Otherwise, a perfectly healthy bull, calved from a mother free from womb infection, is introduced into

a herd where the cows are not free from infection of the genitals. He becomes infected at copulation, and in a susceptible animal lesions are set up in the genitals of the bull who, in turn, may be capable of infecting other healthy females.

Clinical Examination of the Male Genitals.

Before proceeding to a clinical examination of the genitals of a bull in a herd it is wise to consult, if possible, his breeding record. It has been found exceedingly difficult to procure any such records, and no experience has been encountered where any accurate record of the number of copulations required to procure fertilisation has been kept. A physical examination is best carried out in the standing position, and it has not yet been found necessary by the writer to cast an animal, although a complete examination of the penis cannot be made without so doing. In the bull the testicle occupies a vertical position in the scrotal sac, with the *globus minor* at its lower and inner side and the body of the epididymis along the middle and inner border; superiorly the globus major is easily felt. Above this, again, the *vas deferens* can be palpated. A rectal examination is next undertaken and the seminal vesicles can be distinctly felt lying on either side of the penis and shaped like an arrow-head. An examination of the semen requires a collection of this fluid from a previously cleansed and as far as possible sterile vagina of a cow, immediately after service. The actual technique of the collection of the semen leaves room for improvement, particularly if a bacteriological examination of the semen is to follow. The semen collected from the vagina after copulation is examined for volume and appearance. Normally the bull, according to the studies of W. L. Williams, ejaculates 6—8 c.c.'s of a viscous fluid. A smear is made immediately and examined for motility, and, later, stained specimens are examined under an oil immersion lens. So far as his work has carried the writer, his examination of bulls in herds with sterility is limited, and as it is desired to write at this instance only of those pathological lesions actually encountered, an outline of the diseases of the male genitals is not entered upon. In the pedigree herd No. 2, three bulls examined showed nodular venereal disease which yielded to irrigation with iodine solution. One of these bulls also evinced pain on palpation of the left *vesicula seminalis*.

Bacteriology.

A great variety of organisms have been isolated from lesions in diseased conditions of the genital organs, both of the male and female. Pride of place has been accorded for a long time to the *Bacillus abortus* of Bang. In fact this organism has, in the minds of many, occupied a place to the exclusion of all other organisms. In this outline it is accorded a place, and along with others, it may be a cause of endometritis. A streptococcus of the viridans group has been encountered, also a *Streptococcus haemolyticus*. The *Bacillus pyogenes*, *Staphylococcus aureus* and *albus* are also frequently isolated. There would appear to be no more pressing subject than the complete investigation of the organisms which are found in conjunction with lesions liable to cause sterility, and the submitting of each and every variety to proper tests. Until such an investigation has been carried out in English cattle, legislation aimed at the control of sterility (abortion) is a farce.

Control of Sterility in a Herd.

From the foregoing, a definite plan for the control of sterility in a herd can be formulated. At the outset, all breeding operations are suspended until a complete clinical examination is made of all the animals of a breeding age, both males and females. those females showing pathological lesions which are known to be irremediable, and, therefore, leading to hopeless sterility, are removed from further breeding, and, where possible, fattened for the butcher. The barren cows and heifers showing lesions that are likely to respond to treatment are placed under observation and treated until they are deemed likely to conceive. The already pregnant animals are ensured the maximum amount of care at, or subsequent to, parturition. It is safer to assume that all the cows calving down have the uterus infected and, should retention of the fœtal membranes occur, manual extraction is undertaken as soon after parturition as possible. At the time of the removal of the membranes, a liberal irrigation of both horns of the uterus is effected. It has been found for this purpose that a weak solution of pure soluble cresol is most suitable. An attempt is made to withdraw all the fluid so introduced by means of a rubber catheter. Iodoform, embodied in a pessary made with a gelato-glycerine mass, is introduced into each horn. Irrigations with dilute iodine solution are carried out with the rubber catheter until all signs of any discharge have been eliminated. In this manner it can be fairly reasonably assumed that all females, when breeding is recommenced, have clean and healthy genital organs.

If the clinical examination of the bull reveals the emission of bacteria along with the semen, such a bull's breeding life should be cut short. During the breeding suspense irrigations of the prepuce are carried out, and on the commencement of breeding again, the bulls are irrigated shortly before and immediately after service, with a weak solution of iodine.

As shown in the herd reports appended, use was made, early in the writer's efforts at control, of virulent cultures of abortion bacillus. This practice was attended with such startlingly disastrous results that it has once and for all been discarded. Since the acquisition of some little of the knowledge concerning sterility, the writer has been convinced that this discarding was a step in the direct control of sterility in the two herds herein reported.

Herd 1.—Seventy cows, 1918-19.

Farm A—Infected cows.

Farm B—Clean cows ?

November 6th, 1918, four new cows purchased. In the case of one cow the owner was suspicious that the calf was not a full time one. In process of time this cow was beasted by the old bull and he subsequently served a large number of other cows. This one was the first to abort and she was followed by twenty-five others, all of these being beasted subsequent to the one. These cows did not produce a single live calf. In July, 1919, this bull turned savage and attacked two of the attendants. The owner decided to slaughter it and bring into use a fresh young bull. This young bull served the remaining thirty-five cows, and no abortions occurred amongst these. It should be noted that these thirty-five cows were kept at the clean farm. Then some of the twenty-five aborters were served and six of these aborted a second time. No abortions took place in the fields, all in the sheds. The owner noticed a change of colour in the milk which was a deeper yellow and stickier, a day or two before abortion. He was thus able to recognise an imminent abortion and to keep the suspected animal in the sheds.

Anti-abortion vaccine, supplied by the Ministry of Agriculture, was introduced into the herd on July 29th, 1919. In all twenty animals were injected subcutaneously with the vaccine. The best animals, on account of pedigree and deep milking, were injected as it was desirable these should remain in the herd. The subsequent history of the vaccinated animals was as follows :—

Ten remained sterile, continually turning, and had to be fed out as fat.

Nine produced live, full-time calves.

One aborted at seven months.

In January, 1921, this state of affairs caused a reversal of policy in handling and no further use was made of vaccine. Henceforth an attempt was made to ensure, as far as possible, that the genitals of cows and bulls were healthy at the time of service. Since 1919 it had always been the practice in this herd to have retained placentæ removed after twenty-four hours' retention. Irrigation of bull before and after each service was instituted. Irrigations of cows showing any discharge after calving, or retention of membranes, or following removal of latter, were carried out. Pessaries of iodoform were inserted even after normal and healthy parturition. In 1922 this herd had increased by purchases to 100 dairy cows, and the abortions in that year were two in number. In the year 1922 there were three cases of sterility, namely —

(1) *Shorthorn Heifer, born* 1918.—This heifer had produced one full-time live calf on 25th March, 1921. There was no retention of placentæ, but a discharge from the uterus. The oestral periods were regular. She was examined in December, 1921, and a diagnosis showed nodular venereal disease of vulva and vagina, cervicitis and endometritis.

Treatment was attempted without proper instruments.

Result.—She was clear of nodular venereal disease, but still sterile.

July, 1922—*Handling.*—Bi-weekly irrigations of uterus with diluted Lugol's solution, introduction of B.I.P.P. into uterus, dressing of cervical canal with ten per cent. solution of icthyol in glycerine.

August 9th.—Bulled and turned.

August 25th.—Bulled and stood. Due to calve in May.

Result.—This heifer produced a full-time live bull calf in May of this year. There was no retention of the afterbirth, and so far the calf has not developed any scour.

(2) *Red Cow, born* 1916.—This cow had produced four calves and the last one was born in May, 1922, a full-time live calf. Her oestral periods were regular every twenty-one days and there was no retention of membranes.

Diagnosis.—Endometritis and cervicitis.

Treatment, January, 1923.—Bi-weekly irrigations of uterus with weak iodine solution. Weekly injections of iodoform and bismuth suspension. Bi-weekly icthyol dressing for cervical canal.

Result.—February 3rd, bulled and stood.

(3) *Friesian Cow, born* 1917.—This cow had produced three calves, and the last one was born on November 10th, 1921. She was examined on November 21st, 1922.

Diagnosis.—Catarrhal endometritis, vaginitis cervicitis.

Treatment as above.

Result.—February 2nd., Served.
February 26th, Served.
March 22nd, not Served.
April 15th, Served, not pregnant.

Herd 2.—Pedigree Shorthorn Cattle only.

In the spring of 1919, a fresh cow was introduced into the herd and she calved a month before her time. This happened in May, 1919. The calf died and the owner consulted our predecessor with regard to the etiology of the premature birth. As a result of that consultation twelve cattle were inoculated in the brisket with 50 c.c.'s of live abortion bacilli, supplied by the Ministry of Agriculture. This inoculation took place on June 6th, 1919. The history of these twelve cows is as follows :—

(1) *Pedigree Shorthorn Cow, born February 3rd*, 1916.—She calved a full-time live calf in September, 1918, and again on May 25th, 1919. June 6th, 50 cc.'s anti-abortion vaccine injected into brisket. In three or four days she developed an extensive swelling over the site of the injection and could walk only with difficulty. She was, however, got fit to show at the leading show in the country, but on account of the swelling, was placed second. A few weeks after her return from the show she developed an induration of the udder. In September, 1919, she was served and stood.

(2) *Pedigree Shorthorn Cow, born September 29th*, 1910.—On April 16th, 1919, she produced a full-time live healthy calf, which was her sixth progeny. On June 6th, 1919, she was injected with 50 cc.'s anti-abortion vaccine. This

cow, despite numerous services from different bulls, became permanently sterile and was subsequently sold fat to the butcher.

(3) *Pedigree Shorthorn Cow, born February*, 1907.—On June 6th, 1919, she was injected with 50 c.c.s anti-abortion vaccine during pregnancy. On September 2nd, 1919, she produced a live full-time heifer calf. This calf developed scour and epileptiform spasms, and was with difficulty reared and when brought to maturity was served and is breeding normally. The cow developed a swollen brisket. She never again conceived and was subsequently sold sterile to the butcher.

(4) *Pedigree Shorthorn Cow, born September 2nd*, 1913.—On June 6th, 1919, she was injected with 50 cc.'s anti-abortion vaccine and subsequently developed a swollen brisket. On October 4th she produced her fourth calf, a full-time live heifer calf, which lived and is now in the herd breeding alright. This cow never conceived again and was sold fat to the butcher.

(5) *Pedigree Shorthorn Cow, born* 1912.—Calved a full-time calf, her fifth, in February, 1919. On June 6th she was injected with 50 c.c.'s anti-abortion vaccine and a swollen brisket resulted. This cow failed to conceive and was sold sterile to the butcher.

(6) *Pedigree Shorthorn Cow, born* 1915.—In November, 1917, she produced a live healthy heifer calf, which was sold as a heifer. This was her first and last calf. She was injected with 50 c.c.'s anti-abortion vaccine on June 6th, 1919, and later developed a swollen brisket. She failed to conceive and was sold sterile to the butcher.

(7) *Pedigree Shorthorn Cow, born November*, 1916.—On June 6th, 1919, she was injected with 50 c.c.'s anti-abortion vaccine whilst she was pregnant. In September, 1919, she calved her first calf, which was a bull and alive. Three days after birth this calf developed scour and epileptiform attacks, but when a month old, commenced to do better and did fairly well. This cow never stood again and was sold sterile to the butcher.

(8) *Pedigree Shorthorn Cow, born* 1906.—This cow produced her tenth calf in February, 1919, a live full-time one. On June 6th she was injected with 50 c.c.'s anti-abortion vaccine and a swollen brisket followed. This animal proved permanently sterile and was sold to the butcher.

(9) *Pedigree Shorthorn Cow, born* 1911.—On June 6th, she was injected with 50 c.c.'s anti-abortion vaccine into the brisket. In July, 1919, she produced a live full-time heifer calf, her sixth, which heifer in the spring-time breaks out in a rash over the head and neck. She is believed to be in calf at present, but had to be served on numerous occasions before she conceived. The cow was sold in October, 1919.

(10) *Pedigree Shorthorn Cow, born March*, 1911. This is the fresh animal introduced into the herd. In May, 1919, she calved a live calf, her fifth, but this appeared to the owner to be before its time and died. On June 6th she was injected with 50 c.c.'s anti-abortion vaccine. From this date until February, 1921, she was continually served and finally conceived. In November, 1921, she produced her sixth calf, and in December, 1922, she produced her seventh calf. At the present time this cow is pregnant again.

(11) *Pedigree Shorthorn Cow, born February*, 1912.—In August, 1918 she calved a full-time healthy calf. On June 6th, 1919, she was injected with 50 c.c.'s anti-abortion vaccine whilst pregnant. In September, 1919, she produced a full-time bull calf and was subsequently sold from the herd.

(12) *Pedigree Shorthorn Cow, born* 1911. In March, 1919, she calved a white heifer calf; in May, 1919, she was served; in June, 1919, she was injected with 50 c.c.'s anti-abortion vaccine. She stood to service and was sold in calf.

This herd, previous to 1919, had never been swept by an abortion storm, but one or two cows each year had aborted and retained the membranes. The almost universal swelling of the briskets after the injections of June 6th, 1919, caused the owner to put a ban on any further injections of vaccine. The efforts to overcome the state of affairs in this herd have led the writer to the knowledge of sterility as here presented. I am greatly indebted to Professor W. L. Williams, of Cornell University, for supplying me with literature, records and *data*, without which this effort would have been impossible. His works have been freely consulted and the debt is here acknowledged.

Herd Reports Analysed.

HERD I.

1918. Suspected cow introduced.

1919. Abortion storm subsequent to service of this cow by the old bull.
Twenty-five aborters.
Changed bull.
No abortions amongst 35 cows.

1919–20. Live abortion bacillus vaccine.

No. of animals injected.	No. remaining sterile.	No. of Calves (live).	No. of dead Calves.
20	10	9	1
Percentage	50%	45%	5%

1922.

No. of Cows in Herd.	Abortion.	Sterile.
100	2	3
Percentage	2%	3%

TREATMENT.

No. of cows treated ...	3	
No. in calf	2	66%
No. still sterile	1	33%

MAIN FEATURES OF THIS HERD.

Reasonable to believe that the old bull had been infected at the time of service of the one cow.

Transmitted by coitus to the other cows.

Vaccination with live cultures followed by sterility 50%.

HERD II.

Vaccination. Results of introduction of live cultures of AA.

No. of animals injected.	No. of animals pregnant at time of injection.	No. of animals not pregnant at time of injection.	No. of animals sold sterile.
12	3, 4, 7, 9, 11, 12	1, 2, 5, 6, 8, 10	2, 3, 4, 5, 6, 7, 8
	6	6	7
Percentage	50%	50%	58%

No. of animals injected whilst pregnant.	No. of live Calves.	No. of sterile Cows.	Sold no record.	Sold in calf.
6	6	3	2	1
Percentage	100%	50%	33%	16%

No. of animals injected whilst non-pregnant.	In calf subsequently.	Sold sterile.
6	2	4
Percentage	33%	66%

THESE TWO COWS

1—No. 1. Stood to service in September.

2—No. 10. Produced one calf after 30 months.

MAIN FEATURES OF THE HERD.

Vaccination with live cultures followed by sterility 58%.

Only 25% were known to be in calf again.

The Demonstration of the Clinical Examination of the Genitalia of a Cow.

The subject for this demonstration at York was a Red Shorthorn Cow. Her previous breeding record revealed that with her third calf she had aborted at seven months of her pregnancy. The calf was dead and she retained the placentæ. Subsequently there had been a muco-purulent discharge, which had been in evidence up to a few days of the time of this examination.

Her previous calvings had been normal and full-time live calves had been produced. The cow was secured in the main ring and proved very docile, but in the handling care was taken not to upset her, for with an animal that resists instrumentation it is wiser to defer the examination.

A vaginal examination was first made with the aid of the speculum and the small electric torch. The view of the vagina was rather exceptional in that the speculum, fitting just around the *os uteri*, showed the cervix to be dilated. Consequently one could see right into the body of the uterus. The vulva and vagina showed lesions of nodular venereal disease.

Three small ulcers were on the outside of the protruding cervix.

If this cow had been met with in the routine of practice, it would have been a simple matter to introduce the return flow rubber catheter directly into the body of the uterus and to have irrigated freely with a weak solution of iodine.

Her breeding record suggests that, having aborted five weeks previous to the examination, she had had an endometritis.

After draining the uterus a B.I.P.P. suspension would have been introduced.

The vagina and vulva would have been irrigated with weak iodine solution, and the cervix and the uterus on its outer surface would have been swathed with ichthyol solution. For the purposes of the demonstration, a complete examination of this cow was made as outlined in the paper submitted to Congress in the morning.

The findings of this clinical examination are recorded as follows:—

SHEET FOR RECORDING FINDINGS IN THE EXAMINATION OF THE GENITALIA OF COWS.

Owner, N.V.M.A. Address, York.

Name or Herd Number of Animal.....

Date of Birth.....

Has animal been pregnant? Yes. If she has bred, state number of calves produced, 3. Date of termination of last pregnancy, July 12th, 1923. Duration of last pregnancy in days, 220. Was calf alive or dead, Dead. If living was it healthy? ..... Did cow have retained afterbirth? Yes. Or discharge from uterus? Yes.

If a heifer which is not known to have been pregnant, insert in chart the date or dates of service, or in case of œstrum or "heat" and not served, write date in parentheses ( ). In animals which have been pregnant, indicate the dates of service since calving or aborting and dates of œstrum when not served, as in the heifers.

Year	Jan.	Feb.	Mar.	April	May	June

Year	July	Aug.	Sept.	Oct.	Nov.	Dec.

Character of œstrum, regular or irregular, Not seen in œstrum since aborting. General condition, Good. State of lactation, Good.

Date of examination, August 16th, 1923.
Right broad ligament, Normal. Left broad ligament, Normal. Vulva, Nodular Venereal Disease.
Vagina, Nodular Venereal Disease. Cervix, Dilated and ulcerated. Uterus, Normal.
Right ovary, Normal. Right oviduct,.....
Left ovary, Corpus Luteum. Left oviduct,.....
Diagnosis, N.V.D., Endometritis, Cervicitis. Prognosis, Favourable.
Treatment applied, Irrigation with iodine solution and dressings with ichthyol solution.
Treatment advised, B.I.P.P. suspensions with womb irrigations with weak iodine solution and dressings with ichthyol solution.
Remarks.

Discussion.

Mr. L. P. Pugh (Sevenoaks): The task of opening a discussion on the paper to which we have just listened is one of no small responsibility. This paper is something more than a contribution to our common fund of knowledge. It is a challenge to much that we have hitherto accepted without demur. It calls upon us to adopt new view-points and to base our treatment on a novel theory.

This challenge has been inevitable, since Professor Williams, of Cornell University, began to make known his theory of a cycle of genital infection passing from uterus to calf and from one generation of cattle to another.

We are all indebted to the reader of this paper for an opportunity of discussing the significance of Williams' theory, the first opportunity of this sort which we have enjoyed. No doubt we shall have other opportunities in the next few years, for the matter is not one to be lightly dismissed whether we agree or disagree with this distinguished veterinarian. It is clearly destined to open up a new field for veterinary endeavour, as the author of this paper has said. It will doubtless lead to controversies on the many debatable points which are raised, and then, in the fulness of time, we shall incorporate into our text-books results which it is hardly possible to foresee at the moment. These may well be much in advance of those decisions at which Williams has arrived to-day, but they will be largely due to his enthusiasm and to the stimulus which he has provided.

For all these reasons I feel that this day's discussion may well come to be regarded as marking a distinct epoch in the practice of veterinary medicine. I trust I shall therefore be pardoned if I direct my remarks to the whole of the theory as set out in Williams' "Diseases of the Genital Organs of Animals" rather than to those particular illustrations and aspects which have just been brought to your notice. I will admit at once that in many ways the theory seems to me based on observations which are capable of other interpretation. But I wish to make it equally clear that I am myself much indebted to Williams for the stimulus provided by his works, and that I believe that we shall presently trace thereto very great improvements in practice.

Williams' Theory.—Pathology is that department of science which deals with the processes and sequences of disease, and it includes within itself both morbid anatomy and bacteriology. It is in turn the servant of clinical medicine, both curative and preventative. Williams' theory is one of the pathology of sterility. The economic importance of sterility is only too well known. Its causes are only in part understood. In studying this subject, Williams has made a series of observations, none of which is absolutely new. His great contribution to our science is that he co-ordinates these observations and places them in relation one to another. He fits together the pieces of a puzzle to which there has hitherto been no key. Our discussion must now turn on the two questions—has he used all the pieces? and has he correctly fitted them together?

Stated very briefly, the theory is that very many adult cattle suffer from intra-uterine infection, that this is transmitted to the calf before birth, and later finds its way to the genital organs of the calf, and so to its own progeny. This cycle continues from generation to generation, but only at enormous cost in sterility, abortion, scours, etc. We have, then, in this theory two different questions to consider. First, we must enquire whether the existence of this cycle is substantiated, and, secondly, ask ourselves whether Williams is correct in supposing (see page 357) that the lesions associated with endometritis, abortion, etc., are of so non-specific a character that we cannot produce a clinical or pathological picture characteristic of any one organism.

I must leave it to others, better qualified, to deal with the second part of this question, and propose now to enquire whether there is any sufficient evidence that this cycle and all it involves does occur.

The Evidence of a Cycle of Infection.

Apical endometritis.—It will be freely conceded that infection of the uterus is of quite frequent occurrence in cattle, and that this is often present in the form of cervicitis. Williams calls attention to what he considers to be a further form of infection, namely, invasion of the tips of the fœtal sac. He states (page 66), "The common, small necrotic tips are designated as 'normal' by embryologists, but these pass by imperceptible gradations into the degree of necrosis shown in plate 3, which is clearly and grossly pathological." On page 462 he recurs to the subject, and states that this special necrosis is infective, and is associated with endometritis of the adjacent surfaces, and even adds, "Since the allantoic fluid regularly extends into the necrotic tips, its contamination is unavoidable." He further notes that "The histology of apical endometritis has not been studied. The bacteriology has had almost no attention. My colleagues, Carpenter and Hagan, have obtained chiefly streptococci of the viridans type and paracolon organisms."

On the evidence thus produced there is practically no reason to suppose that the form of apical endometritis described is, in fact, an endometritis at all.

It is possible that organisms have been found in cultures which have been inoculated from material obtained from the apices of uteri, and even that they have been of the types named. But no information is to hand how these were opened with due regard to avoiding contamination, nor as to whether the animals were obtained in the slaughter-house or were examined under experimental conditions. It is even true that in some few cases there may be apical endometritis, but this does not go far to support the claim that all apical necrosis is to be regarded as septic. Apical necrosis is too constant and too much in accord with the general rule that unwanted structures tend to atrophy to make any such explanation of its nature readily acceptable. Again, plate 3, to which Williams refers as " clearly and grossly pathological," is not convincing. It shows great recession of the sac from the wall of a non-gravid horn, the space so formed being partially occupied by an exudate of a brownish yellow colour. The non-necrotic part of the horn is in direct contact with this, but nevertheless appears to be free from injection or any other sign of ill-health. Yet we are asked to believe that this exudate is due to an endometritis caused by such organisms as the hæmolytic streptococci. Frankly, the intimate association of a " grossly pathological exudate " with a healthy sac of fluid which (according to Williams) is actually being infected from the exudate and yet remains healthy is rather more than one is prepared to accept.

Transmission of Infection to the Calf.—Williams holds that infection is commonly conveyed to the calf through the utero-chorionic space, his views being set out as follows on page 69 :—

> " The one hundred cotyledons with their stalks serve as a great colonnade, producing a vast space between the non-placental areas of the uterus and chorion . . . in this space, as in the non-gravid uterus, bacteria commonly exist, and need only to invade successfully the thin non-placental chorion and adherent amnion to gain the amniotic cavity and fluid."

The possible fallacies in this theory are better understood if we bear in mind the possible alternative, namely, that calves die in utero or are born in a feeble condition because of inanition due to defective nourishment, and that death of the new born calf is commonly due not to pre-natal injection, but to infection via the navel or from ingestion of contaminated milk, uterine discharges, etc. One readily admits that Williams' " vast space " and " great colonnade " form a potential space, but this is normally the situation of the so-called " uterine milk." The latter is formed in a somewhat complicated manner, which it is not now necessary to describe, but it should be noted that it contains in suspension or solution the products of the digestion by the trophoblast of part of the uterine mucosa, etc. This solution is supposed to be brought about by enzyme action. When we remember the very powerful phagocytic activities of the trophoblast in addition to the enzyme action, we are bound to be surprised at the statement that bacteria *commonly* exist in this space throughout pregnancy. Neither does Williams produce any evidence in support of that statement, nor does he state by what means his colleagues have differentiated cocci, bacteria, etc., from nuclear remains, " stabschen " and other normal constituents of normal uterine milk.

The assumption that bacteria can pass easily through the " thin non-placental chorion " is similarly unsupported. No suggestion is made that the membranes show evidence of having been invaded (except apically) yet we know by experience what effective bars to the spread of infection such thin membranes can be. Williams' assumption really rests only on the finding of bacteria on the other side of these membranes, *i.e.*, in the fœtal fluids. We have, then, to ask ourselves what evidence there is in support of these further findings.

Intra-uterine Infection of the Calf.—Since we know that Bang's bacillus finds its way to the stomach of the fœtus in a proportion of cases, there can be no reason, arguing by analogy, why other organisms should not occasionally do likewise. But there is an important difference in the two cases, for the chorion in Bang's disease is characteristically infiltrated and œdematous, while the chorion in those cases which come under Williams' classification is often healthy, and shows no signs of any such diseased condition as would be expected if it had afforded a passage to virulent organisms. A thesis of the importance of that put forward by Williams cannot be considered at all adequately supported until such patent difficulties as this have been explained. Of course it should be borne in mind that I am only now criticising the cycle of infection, and therefore only referring to the placentæ of cows that have borne live calves, and not to the lesions found in the fœtal envelopes of early aborts.

The Time of Uterine Infection.—Williams (p. 509) says : " I have held that the infections which prevent or interrupt reproduction invade the uterus prior to the sealing of the cervical canal; either infection was present in the uterus at the time of coitus or it was introduced during that act." He states this view repeatedly. We are asked to believe, therefore, that these virulent organisms can live (in many cases for the full term of pregnancy), giving no evidence of their presence by affecting the health of the dam. Also that the calf under these circumstances can develop normally and be born alive although it has been grossly infected over a long period within the uterus. Much more detailed evidence is required before this statement becomes entitled to serious discussion.

Persistence of Intra-uterine Infection.—It is an essential part of Williams' theory that the infection which the calf incurs while still *in utero* may persist in it until adult life, and passing to the uterus may cause abortion, still-birth, etc. Unfortunately Williams has not satisfactorily traced any one organism throughout the cycle, or if he has, one has failed to find it reported in any of our journals. Thus, at this

crucial point, as at many others, the whole theory of a cycle of infection breaks down for lack of any evidence.

If we return for a minute to our simile of a picture puzzle, we are obliged to confess that the result produced by Williams presents nothing that any of us would care to call a picture. The key to the puzzle is not yet found.

In the remarks already made one has attempted to deal with only some of the salient points, and every time one has been faced with assertions lacking scientific support. If this seems a presumptuous or an unduly severe criticism, it must be borne in mind that where no evidence is offered, no other sort of criticism is possible.

But lest one should be accused of purely destructive criticism, it is desirable that there should be set forth the views on these subjects which appear to command common acceptance in this country to-day. These views are partly those of experience in the field, but are of course largely those of my various teachers, more especially Sir John M'Fadyean and Professor J. T. Edwards, to whom I wish to make due and grateful acknowledgment.

Relationship of Abortion, Scours, etc.—It is generally admitted that most cattle have a very varied vaginal flora. After the birth of the first calf it is common to find some further extension of this infection in the form of cervicitis, pyometra, salpingitis, etc.

A cow so infected may fail to conceive, or, if she conceives, may abort during the first three months of pregnancy or give birth to a living but unhealthy calf. But in the majority of cases this will probably be due, not to actual bacterial infection of the calf, but to inanition due to defective food and oxygen supply. It is possible (from the analogy with syphilis in the human being), but not proven, that a small proportion may be born infected. Quite a number of cows appear to suffer from a recent (blood) infection of the uterus during the terminal days of pregnancy, giving rise to retention of the placenta and other signs of metritis.

Should the calf be born alive, it is at once exposed to the risks of infection through the navel and through the ingestion of contaminated food, milk, etc. Many believe that the vast majority of all cases of scours, calf septicæmia, pneumonia and arthritis are due to such infection.

Then, if the calf lives and survives this infection, this is commonly a sign that the tissue reaction has actually destroyed the organisms; but, again on the analogy of human pathology, the possibility of carriers must be borne in mind, even if there is at present no evidence to suggest or reason to suppose that such carriers have any practical importance.

Later, as the calf grows up, it may be exposed to the chances of specific infection (as opposed to the non-specific endometritis) by such organisms as Bang's bacillus, and perhaps by others that have yet to be described, and to such infections it is reasonable to ascribe the majority of epidemics of abortion seen in this country.

Gentlemen, although I have only touched on a few of the controversial points, yet I fear that I have unduly prolonged my part of the proceedings, but hope that by presenting a little of the other side of the question Mr. Barker may be rewarded by a long and profitable discussion. I should like, in closing, to make it quite clear that however little appeal the theories of Williams may make, there can be no doubt that his continued insistence on aseptic and antiseptic treatment deserves our warmest acknowledgment and support.

Major EUSTACE MONTGOMERY said there was no doubt that Williams had jumped to many conclusions; particularly was that the case in connection with the bacillus of Bang. Numbers of tests carried out by Williams did not justify the conclusions to which he appeared to have so hastily jumped, but that his work was founded on valuable data was incontestable. The point he would emphasise particularly that day was their lack of knowledge with regard to the bacillus of Bang. They were apt, reading their text books, to form certain notions and certain ideas with regard to contagious abortion, and when the work in the colonies and foreign countries was first begun, they were apt to consider the finding as being a novelty; that was, when the first positive case of contagious abortion was diagnosed in Eastern Africa, they hastily jumped to the conclusion that it was the first case. The more those cases were examined into, and the greater the number of observations made, the more and more convincing became the evidence that contagious abortion had existed in Eastern Africa from time immemorial. In our territories the complaint might take a very different form to what it did in others. Unless they could get down to fact, and not debate their own views and theories, they would continue in abstraction for the rest of their days.

Mr. T. J. BOSWORTH said the state of their knowledge with regard to the various causes of sterility was so vague at the present time that it appeared to him to be a very grave mistake for them to jump too readily to conclusions before they had carried out sufficient research work to justify such conclusions. If they did that, they were in danger of taking a bye-path off the main road, and probably setting up a great hindrance to the subsequent elucidation of the problem. It was, he thought, the absence of exact scientific *data* on this subject which had made it necessary to rely to a large extent on the observed clinical occurrences, as the author appeared to have done in outlining his theory of womb infections. He was not at all sure, however, that they were justified in drawing the conclusion that these events were the necessary sequel the one to the other, or that some of them might not arise quite independently of the rest. For instance, it was by no means agreed that white scour in calves was always to be found in herds in which abortions, retained placentas, and sterility were prevalent, or that it was in any way connected as to its etiology with one or the other of these. He thought that the bulk of the evidence

went to show that in most cases this disease was extra uterine in its origin, though the possibility of infection by secondary invasion of a placenta already infected by *B. abortus*, either at the time of birth or a short time before the actual birth, within the uterus itself had been recognised as being possible by so eminent an authority as Theobald Smith. He pointed out, however, that he had seen many cases of a diseased placenta where the calf did not subsequently develop either scours or pneumonia. The idea that any one of a group of widely-differing organisms could cause infection of a gravid uterus, establish itself in the body of the offspring and remain latent in it until it reached sexual maturity, then to affect its reproductive powers and spread to the opposite sex at the time of copulation, was one that seemed to him, if it were true, to hold out a very serious prospect; but he did not think it was tenable. They had only to consider for a moment what it meant, what prospect it held out for the stockowner. Here they had a disease which, according to this theory, must spread in geometrical progression, and if that be the case, must mean in a comparatively short spell of time the virtual extinction of the bovine species. Fortunately he did not think they need take so grave a view. Indeed, since sterility was no new condition, but had been with them for generations, the present state of the livestock industry gave the lie to this theory.

Captain W. F. Aston gave a few of his experiences which led him to support Williams' book.

Mr. H. Begg suggested that they should deal with the subject another year. It was, he said, too huge to be dealt with in a single day, and he thought they ought to divide it into five sections, and deal with it in a thorough way. The subject was one of vast importance, and had not been much dealt with in this country. They ought to seek out men for next year who had an interest in the different types of cases.

Dr. Septimus Sisson (Ohio): I have been very much impressed by the ability and care with which the subject of sterility has been presented and discussed. It will no doubt be generally agreed that the veterinarian and the stockowner are confronted by no more serious problems than those of sterility and abortion. The profession is now fully awake to the situation, and is in consequence devoting much thought to the solution of these problems. As usual our studies may be arranged in three categories: (1) Anatomical, gross and microscopic; (2) Physiological; (3) Pathological, including both the structural changes and functional aberrations.

It is most regrettable that we have as yet no adequate description, in English at least, of the structures involved in the domestic animals. This assertion may seem almost incredible, but I consider it justified; there is almost nothing in our literature concerning the microscopic structure of the reproductive organs of the larger domestic animals. This state of things obviously must be remedied before we have a proper basis for further studies.

Being merely an anatomist, it would, of course, be out of place for me to attempt to discuss other aspects of the subject. But I may be permitted to draw attention to one or two points in applied anatomy concerned in exploration per rectum, a topic which was considered somewhat briefly in Mr. Barker's paper.

Beginners find some difficulty in locating the ovary quickly and certainly, and it is useful to have a good landmark for this purpose. The usual tendency is for the tyro to palpate too far forward. In the case of the non-pregnant cow the position of the ovary is determined easily by using the external iliac vessels as landmarks. The artery is easily recognised at the pelvic inlet, and the ovary usually lies just a little in front of it and a little below (ventral to) the middle of the lateral part of the pelvic brim. The distance from the anus is readily estimated by remembering that the ovary is ordinarily in a transverse plane, through the tuber sacrale (internal angle) of the ilium. Normally the ovary is separated from the abdominal wall only by the microsalpinx. During pregnancy the ovary is further forward and slightly lower down, but sufficient reliable observations on the migration of the ovary in this sense are not available, so far as I am aware.

Care and experience are necessary in drawing conclusions concerning the corpus luteum on the basis of palpation per rectum. It is not rare to find that a large corpus luteum may be present when superficial inspection or palpation show little or none visible or palpable. The bulk of such a corpus luteum is in the central part of the ovary, and therefore concealed.

Examination of the middle uterine artery has proved very useful in the early recognition of pregnancy and in determining which uterine horn is gravid. The beginner will find the following method useful for locating the artery: Use the external iliac artery as a landmark. The middle uterine artery arises from the internal iliac by a common trunk, with the umbilical; this trunk is commonly an inch or two in length, and lies behind the first part of the external iliac. The middle uterine artery crosses over the iliac in a direction downward and forward, the inclination forward increasing with the advance of pregnancy. In the non-pregnant heifer there is no forward inclination, no increase in calibre of the artery, and only the ordinary pulsation is present. It may be observed here that the position of the gravid uterus is not necessarily dependent on which horn is gravid; a gravid right horn may lie chiefly to the left of the median plane or *vice versa*. The difference between the right and left arteries in calibre and pulsation is decisive.

The practitioner will find it advisable to read rather critically some of the matter which is appearing in our veterinary journals. There appears to be a tendency in some quarters to "exploit" the subject, to make statements which are not based on sufficient observations made by competent workers, to advise procedures of doubtful value, and perhaps to mislead the unwary.

Professor G. H. WOOLDRIDGE: I am constrained to intervene in this discussion for several reasons. I think, in the first place, one should avoid regarding sterility as being a disease of itself, but rather as a very important symptom which may be indicative of various conditions, and until we get that idea driven home, we are likely to fail in solving the problem. If you take that attitude, you find that sterility may be due to infective organisms in certain cases, and that the bacillus of Bang may be responsible in some instances, but that it is not the only cause, and you recognise other factors as being responsible for conditions of the uterine tract interfering with the activity of the spermatozoa at the time of coition and then with fertilisation. Amongst these conditions is that of nodular vaginitis, producing often a mechanical straining which will result in the expulsion of the seminal fluid.

Another important issue is as regards physical influences as opposed to any infective troubles. It has been the experience of quite a number of stock-owners that as soon as the cows have reached their highest pitch of physical perfection, sterility has arisen. That makes one wonder whether there is any association between sterility and the endocrine secretions. Amongst these endocrine secretions, which may have some association with it, perhaps the most intriguing is the thyroid, but there is also the pituitary body, and there are still others. This, then, may be one of the things that has got to be followed up, not only in the female, but also in the male. So that a discussion such as we are holding to-day will have useful results if it will stimulate more and more centralised enquiry, which will necessarily be a very costly one, and which will be useless unless there is a suitable amount of time and money spent upon it. I have to thank Mr. Barker for bringing the paper before us and expressing the side of the question which he does express; but there are many other sides to the problem, and we shall not get a solution of it until we deal with them.

Mr. WILSON: I want to take the other side a little. I have been inoculating since 1914, and while, as a preventive of abortion, I have not much faith in it—especially in older cattle—I have never had a case in which I could say that inoculation causes permanent sterility. I do not see that there is any justification in blaming the abortion vaccine as a cause of permanent sterility; it may be a cause of slight temporary sterility. In regard to removal of the placenta, I believe in giving cows 24 hours, and I think that is one method of trying to prevent abortion.

Mr. BARKER, in his reply, expressed pleasure at the way the paper had been discussed. He had really founded it on Williams' hypothesis. It had got to be more than a hypothesis with Williams—a conviction. If they got to work and controlled sterility and abortion in herds, working on the hypothesis, and obtained good results, then he thought they would form the opinion that there was something in it. If they could come back in twelve months' time and bring their figures along with them, then they might be able to convince Mr. Pugh and those who rather doubted it—some definite figures that Williams' theory was the best thing that could have happened for the veterinary profession. With regard to vaccines, he thought that, so far, only one had been used for abortion, and that was founded upon Bang's bacillus of abortion. One hesitated to say too much about vaccines, because at the present moment a lot of work was being done in connection with them. He did not think any of the speakers had denied the possibility of organisms, both Bang's and others, appearing in the womb. If they were there, they were pathogenic organisms which might give rise to lesions. If they were to keep up with their American cousins, and even to check the work of Williams, there was urgent need for laboratory help to be extended to clinical work. (Hear, hear.) He thought he had produced records to show the hypothesis was well worth working upon. (Applause.)

Captain W. F. ASTON writes concerning this subject:—

The following case has come to my notice since the York meeting. I would draw your attention to the following outline in support of Williams' vicious cycle of womb infection.

Cow H.M., born in 1915, bred as follows:—

1918	1919	1920
Live Calf.	Abort dead.	Live Calf G.M.
1921		1922
Live Calf (Arthritis).		L.C.

The last calf was born on September 22nd, 1922, and since then she has been sterile. She reacted to the agglutination test for epizootic abortion in 1919. After the last parturition there was a retained placenta removed manually, and the cow was treated and apparently cleaned up. In my opinion she is now suffering from a left salpingitis—the salpinx being thicker than a lead pencil, and the left ovary enlarged and cystic. The endometrium is considerably thickened, and she is not likely to breed again.

The daughter G.M., born in 1920, after three services, calved on December, 1922, the calf (a bull) suffering from congenital arthritis. She apparently cleaned up all right; since then she has been put three times to a bull (whose breeding record is bad), and also served by another bull on June 26th, July 1st and August 14th. It is thought that she may now be pregnant, after taking 20 months to produce one live calf (counting from first service), and that calf diseased.

In his annual report for 1922, the Bradford Medical Officer of Health (Dr. J. J. Buchan) records that during the year 1,854 samples of wool, hair, and dust were examined for the presence of anthrax. The samples found to be infected were as follows:—Local samples—Mohair 12, mohair dust 12, skin goat hair 2, alpaca 2, alpaca dust 1, and wool 5. Liverpool samples—East Indian goat hair 11, cow tail hair (Indian) 1, and wool 8.

The Veterinary Record.

6th October, 1923.

National Veterinary Medical Association of Great Britain and Ireland, Limited.

Cheques should be made payable to the Acting General Secretary at the Offices of the Association, 12 Buckingham Palace Road, S.W.1.

N.B.—Members receiving this paper in a brightly-coloured wrapper will please understand that their subscription is already overdue, and should be forwarded at once to the above address.

THE NEW SESSION.

This week we see the serious commencement of another period of activity in our profession. With the re-opening of the Schools we may say that the holiday season is over, and that we are settling down to work once more. The various committee meetings of the R.C.V.S. took place on Thursday, and the Council held its second quarterly meeting on Friday. On Wednesday there were meetings of three committees of this Association, while later in the day there was a meeting of the Council. These meetings inaugurate the winter's work, and very important work it is, carrying with it a great amount of responsibility. It is well for those who are not members of any of these committees to pause awhile to consider to what trouble and expense others will go in order to carry on the work and help to further the interests of the profession. These men are out to do good, and they seek no reward. No doubt there is honour in holding such positions, but the honour is not conspicuous to the public, and does not carry much glamour in the public eye, and it certainly does not "bring grist to the mill." No, these men are disinterested, and the general body of practitioners should feel proud of them. They wish and try to do the very best in their power for their fellows, and they deserve the gratitude of those many others who do little or nothing, and who are only too ready at times with criticism, which is often ill-informed.

There are others, also, whose names do not appear in print, who feel themselves ill-adapted for work on committees or councils, who prefer to remain in the background, and who yet are genuinely anxious to do something to help. Such are many contributors to this journal. It is well for us to be reminded of these people, and now, when we are starting our new session, so to speak, we might well make a resolve or—better still—a definite effort to emulate their good deeds, and each and all do our share in uniting our profession and furthering its interests in every possible way that lies in our power. Along that path lies Progress and Success.

"External Dictation" and a Salary.

But the B.M.A. Wins.

There is a lesson, of an encouraging nature to be learned by our profession from the following controversy over a medical officer's salary reported in the *Daily Telegraph* of September 20th:—

"St. Pancras Borough Council, at their meeting last night, discussed a recommendation of the General Purposes Committee that the salary of the Medical Officer, a position which is at present vacant, be fixed at £1,100 per annum, increasing annually by £50 until it reaches £1,400. When the vacancy was last advertised the Council offered a salary of £1,000 a year, but exception was taken to it by the British Medical Association on the ground that it was too low, and the only applicant for the position withdrew after his appointment.

"The recommendation met with some opposition.

"Councillor G. Cash said the Council was asked to surrender its position and authority as a borough council at the dictation and at the bidding of a body that had no *locus standi* or authority in the borough. He was opposed to any surrender by the Council to external dictation.

"Dr. Gregg proposed, and Councillor A. Ravenshaw seconded, an amendment that the salary be fixed at £1,250 a year, rising by £50 a year to £1,400.

"Councillor F. B. Gurney (chairman of the committee) said the medical profession had every right to form an association to protect their interests. The sum of £1,100 a year was the salary approved by every party on the Council, and he hoped that the British Medical Association would give it serious consideration.

"The committee's proposal was ultimately adopted."

A new method of stamping out sheep scab is to be adopted as from next July. After that date, a farmer who is found to have scabbed sheep amongst his flock, and who cannot show that he has taken all reasonable precautions, will be heavily fined. In other words, the responsibility will be upon the individual owner, but it does not follow even then that double-dipping will not be insisted upon in areas where the disease is known to exist.

The damage to hides that could be avoided if cattle had no horns is probably slight. In most cases the damage would only occur to the beef by causing bruises, and would not really injure or penetrate the hide. Horn scratches, however, are the subject of complaint from tanners, and cause them to discriminate.

Devon F.U. has adopted a resolution to the effect that there is no necessity for further legislation for the restriction of the export trade in horses.

Clinical Note.

The Editor will be glad to receive from members and others contributions to this column of reports of interesting cases.

Ruptured Diaphragm.

By J. WRIGHT CONCHIE, F.R.C.V.S., Kidderminster.

I was asked recently by a farmer to make a *post-mortem* examination of an aged bay cob gelding, used on his milk round. This cob had never required the attendance of a veterinary surgeon, and was quietly driven by the owner's daughter on the milk round. On this particular morning the cob stumbled on going down hill, through treading on a loose stone, on which it rolled. It partially recovered itself, but, in the end, fell and was dead in a few minutes. I found the diaphragm ruptured—practically torn into ribbons. All the organs of the body were healthy, and there was no indication of colic having been present. It seems certain that the diaphragm was ruptured in the animal's attempt to recover a sure footing.

Abstracts.

Technique of Parasitic Worm Collection and Preservation.

This paper aims at supplying details of technique for the purposes shown in the title, which can be applied in the field or in a field laboratory.

In connection with "collecting" emphasis is laid upon the necessity of searching organs other than the alimentary canal. The mucous lining of the latter is to be searched for encysted parasites. Small worms may be collected from the contents by stirring these in water in a tall jar and after allowing a few minutes for the worms to settle decanting the fluid. The necessity of caution in removing cestodes from the mucous membrane is stressed, as it is extremely likely that the "head" will remain embedded in the membrane.

Encapsuled or encysted nematodes are removed more easily from fresh than from fixed tissues. Sometimes, if the enclosing tissue be cut and placed in salt solution, the worms will emerge of their own accord.

For washing parasites 1 per cent. salt solution may be used. Species which have a mouth capsule which may contain epithelium or other material may be shaken fairly vigorously in salt solution without damage. For cestodes, unless the cuticle is required to be in perfect condition, lukewarm water may be used. Washing should not be prolonged. If it is required to keep worms alive they should be kept in their natural elements and not placed in water or salt.

Methods of fixing are not applicable to all groups indiscriminately. The resistant cuticle of nematodes renders cold fixatives unsuitable. For these the best is Looss' hot 70 per cent. alcohol. The liquid should be heated till it steams, but does not boil. BOULENGER recommends 70°C. After fixing, the worms are preserved in 70 per cent. alcohol.

In the case of small specimens it is sometimes an advantage to use a 5 per cent. soluton of pure glycerine in 70 per cent. alcohol. The procedure is the same.

Formalin should be avoided, and Baylis is of the opinion that even if heating is to be avoided 70 per cent. alcohol is preferable to formalin.

WARD recommends a mixture of equal parts of acetic acid, absolute alcohol, saturated watery corrosive sublimate containing 0.25 per cent. osmic acid. Acanthocephala should be fixed with the proboscis protruded. This may be achieved by pressing the worms gently between slides and fixing while the pressure is maintained. Cold or hot 70 per cent. alcohol may be used.

For trematodes the following method is recommended. The worms are twice washed with shaking in salt solution. After the second shaking an equal volume of saturated corrosive sublimate (in water ?) with a few drops of acetic acid is added. The shaking is then continued for a few minutes. This cleans the specimens and prevents muscular contraction. The worms may be left in the sublimate for a few days, or transferred to water after a few minutes. They are then washed in running water for 12—24 hours or transferred to 70 per cent. alcohol tinted with iodine to the colour of sherry. This should be changed until the colour of the iodine ceases to disappear.

Special methods are advised by BRAUN and LUHE. The worms are washed in salt solution, the mucous brushed off, and they are then stretched on slides. A drop of fixing fluid is placed on a coverglass, which is applied with slight pressure. If the worms are large and fleshy they may be pressed between slides by rubber bands. The fixing fluid is run in at one end and drained off at the other. The fixing solution recommended is saturated watery picric acid 50 parts, water 48 parts, glacial acetic acid 2 parts. When the worms are rigid they are removed to dishes of the liquid until they are opaque. After a brief wash in water they are brought up through weak alcohols to 70 per cent. In place of the picric acid solution Muller's liquid may be used (potassium bichromate 2.5, distilled water 100, sodium sulphate 1).

Cestodes may be prevented from tangling by holding them up by the end remote from the scolex and dipping them quickly several times into a jar of fixing fluid. They may be drawn against the side of the vessel after each dipping to exert a slight pull on the strobila.

The fixing fluids should be used cold, as hot fluids render the worms brittle. Bouin's fluid is superior to Zenker's for cytological purposes, but does not yield such straight extended specimens. Specimens may be left in for any length of time without deterioration. Schaudinn's fluid gives good results and specimens should be fixed for ten minutes to half an hour.

A simple method which is good enough for identification but not for cytological work is to pour on

to the washed specimens a mixture of 90 volumes of saturated sublimate and 10 volumes of glacial acetic acid.

[BAYLIS (H. A.). Notes on the Collection and Preservation of Parasitic Worms. *Parasitology.* 1922. Dec. Vol. 14. No. 3—4. pp. 402—408. *Ex. Trop. Vet. Bull.*]

Mechanism of Stomoxys spread of Trypanosomiases.

Van Saceghem finds that stomoxys flies do not act, as they have been credited with doing, simply as a hypodermic needle in conveying trypanosomes from animal to animal. He finds that if a stomoxys which has engorged on an infected animal be examined trypanosomes and unaltered corpuscles are present in the stomach but no parasites, and only deformed corpuscles in the proboscis. This is held to show that the saliva is destructive to the trypanosomes, those that are present in the stomach have escaped the action of the saliva by passing through to the stomach rapidly. Some may remain in the pharynx and buccal cavity. The rapid passage of the blood through the proboscis is effected by a pumping action of the pharynx.

It is only when a fly does not get a full meal on one animal that it goes to another to complete it, and it is in this way that trypanosomiasis is propagated. The infecting trypanosomes are not present in the proboscis, but are pumped out of the pharynx and possibly the buccal cavity when the fly attacks a new host. Transmission by stomoxys only occurs when animals are close together and the spread of the infection is slow. In the absence of glossina trypanosomiasis can only be introduced into a healthy area by an infected animal, and, when outbreaks occur the healthy herds can be protected by keeping them at a distance from infected ones.

[VAN SACEGHEM (R.). Mecanisme de la propagation des trypanosomiases par les stomoxes. The Mechanism of the Spread of Trypanosomiasis through the Medium of Stomoxys.)—*Bull. Agric. Congo Belge*, 1922. Sept.—Dec. Vol. 13. No. 3—4. pp. 606—609. *Ex. Trop. Vet. Bull.*]

Tetanus Immunization with Iodised Toxin.

The author has tested the method described by VALLEE and BAZY in 1917.

The tetanus toxin was obtained by growing the bacillus in "liverpiece broth" with the addition of 10 per cent. of fresh blood (of any species). The lethal doses of this toxin were as follows:—Mouse, 0.00001—0.000005 cc.; guinea-pig, 0.0001—0.00005 cc.; rabbit, 0.001 cc.

The solution of iodine was 1 part of iodine, 2 of potassium iodide in 200 of water. The mixture of this solution with the toxin in the proportions recommended by VALLEE (2 of toxin to 1 of iodine) was found to be dangerous for guinea-pigs and rabbits. A mixture of equal parts was found to be quite safe. Three injections of 1, 2, and 4.5 cc. of this mixture effectively protected guinea-pigs.

Rabbits are easier to immunize than guinea-pigs, a single injection sufficing. In goats immunity was produced by two injections of 2 cc. Sheep and horses were immunized by two injections of 5 cc.

The iodized toxin retained its prophylactic properties for about 40 days after the mixture was made.

[OKUDA (K.). On the Prophylactic Value of Iodized Tetanus Toxin.—*Jl. Jap. Soc. Vet. Sci.* 1923. Mar. Vol. 2. No. 1. pp. 91—92. *Ex. Trop. Vet. Bull.*]

VETERINARY WORK IN NIGERIA.

The development of Northern Nigeria as a supplier of cotton is already admitted to be an imperial interest. It is only because the question is less immediately urgent that the possibilities of Northern Nigeria as a supplier of meat have not yet attracted equal attention, and the Veterinary Department is considered of minor importance. Nevertheless the Department shows in its "Annual Report for 1922" (Government Printer, Lagos), that it is doing good work in clearing the ground for the men who shall come when Nigerian meat shall be an important item in the imperial larder, by instructing and guiding Native cattle owners in the breeding and care of their beasts.

At present the activities of the European veterinary officers are confined to Zaria and Kano Provinces, and it is impossible to judge of the value of the work of Native Stock Inspectors in other Provinces.

The system of making district and village heads responsible for the livestock of their Province has produced good results. "The Village Headman is the crux of the whole matter," and his vigilance in watching for disease is stimulated by the knowledge that any neglect on his part will be reported by the Field Veterinary Officer to the Resident, who will pass the matter on to the Emir, who will deal with the delinquent. "In consequence, to avoid trouble, he exerts a certain amount of energy in his duties." Owners of diseased herds are chary of reporting the existence of disease, but there is an increasing tendency on the part of owners of clean herds to report the existence of disease in others, since they know that by doing so the latter may be segregated and their herds be rendered less liable to contagion. The chief spreaders of disease are traders who are constantly moving about the country with cattle.

An annual improvement in the work of the Native Administration, especially in the northern part of Zaria, is reported, and is imputed to the fact that a Veterinary Officer has been in fairly regular association with the Native Administration officials. This is a strong argument for increasing the personnel of the Department.

The cattle census shews a considerable increase over the figures for 1920, the total for all the Provinces being only 35,000 less than for 1919.—*West Africa.*

In Sheffield the authorities find that horse and pony traction is being confined more and more to short journeys over easy gradients, while motors are used for journeys of substantial length and for hill work.

Association Reports.

Mid-West and South Wales Division.

The division visited Swansea for this interesting meeting, which was held on Thursday, September 20th, 1923, the occasion being rendered specially noteworthy by reason of an infinitely painstaking and consequently highly successful demonstration on canker of the horse's foot by Mr. J. R. Barker, of Hereford.

Difficulty of access from the southern shore of the Bristol Channel limited the numbers of the contingent from that section of the division, but strong local support was accorded the President, Mr. W. D. Rees, of Trealaw. There were also present Messrs. J. R. Barker, Hereford; S. B. Clode, Pontypridd; J. C. Coleman, Swindon; W. T. Edwards, Neath; E. P. Evans, Cardiff; A. F. Good, Lampeter, Cards.; E. L. Harber, Hirwain; F. C. Hobbs, Newport; R. Trevor Howells, Neath; W. Davies John, Ammonford; J. H. Maclaren, Mountain Ash; R. Moore, Treorchy; C. E. Perry, Bristol; J. L. Perry, Cardiff; J. S. Pike, Swansea; J. F. Rees, Carmarthen; A. J. S. Reynolds, Haverfordwest, Pem.; H S. Robinson, Newport; E. Sayer, Mumbles; W. R. Williams, Bridgend; C. W. Makinson, Swansea; together with the Hon. Secretary, Mr. J. J. Aveston, of Bath.

Messrs. J. Campbell Hill and W. E. Pugh were present as visitors.

The proceedings opened—as they almost closed—with the demonstration, which, taking the greater part of the afternoon, left little time for the remainder of the programme. Fortunately, however, the business was light, and members were allowed plenty of time in which to follow Mr. Barker in his manipulatory exposition of the thorough and only satisfactory way of dealing with a bad case of canker. A paper and discussion upon the subject were to have followed, but these had to be postponed to the next meeting of the division.

After assembling at the Hotel Metropole, the members proceeded to the cartage premises of the G.W.R., where Mr. Pike had the subject and the place in readiness for the operation. The absence of stocks or any other means of mechanical limb restraint, however, made the demonstrator's task a particularly arduous one.

With characteristic zeal, Mr. Barker selected the worse of the two affected feet—the near fore. He emphasised, at the outset, the value of stocks, which enabled one to do all the requisite cutting and rasping oneself in no matter how severe a case, for, when holding the foot up, a disproportionate amount of rasp work was necessitated as the animal would not tolerate the freedom with which the knife was used when restrained in stocks. During the initial removal of the shoe it was pointed out that it was of great importance, when replacing, to utilise the same nail holes.

They could never tell the extent of the disease until they had cut down the horn remorselessly; all under-run horn must be removed, for they could never hope to get their dressing underneath a wad of horn. This case looked as if it had commenced from the front of the sole, and the difficulty here would be, after cutting and rasping away the necessary amount of horn, to get the special shoe on afterwards in such a way as to ensure even pressure. If there was horn left at the quarter, however, it was possible to get even pressure at the back by means of a bandage.

By patient use of the toeing knife, Mr. Barker revealed the whole of the sole to be under-run, together with a considerable part of both the inner and outer walls, the latter being particularly bad.

In reply to an enquiry, Mr. Pike said that the case had been going on for six months. The foot had appeared to be progressing favourably, but the vigorous use of the knife revealed a very different state of affairs, and one for which, probably, few practitioners would have been prepared. The afternoon wore on, but fresh diseased areas were disclosed, and others which bled at a touch, while islands of sound horn proved to be under-run. Eventually the operator got away most of the diseased material, leaving only a little at the toe to be treated with nitric acid, except where there was very little or no horn covering the keratogenous membrane (recognised by its glistening surface). Where the horn was thin nitric acid could not be used unmixed with Stockholm tar as a dressing.

The removal of the diseased horn thus being completed as far as was practicable, Mr. Barker dressed the foot with a corresponding dexterity, placing two strips of tow saturated with nitric acid and Stockholm tar in the lateral lacunæ, and placing a similarly-treated and extensive pad in position under a slip sole, which was then securely bandaged to the foot.

Prior to the completion of the demonstration, the President and Secretary, collecting sufficient members to form a *quorum*, made their way back to the Hotel Metropole, in order that the essential items on the agenda of the business meeting might be dealt with before members living at a distance had to leave.

The minutes of the previous meeting, having been published in the *Veterinary Record*, were taken as read and signed.

A letter of apology for his absence, especially in view of the fact that a resolution in his name was down for consideration that day, was read from Mr. W. M. Scott, of Bridgwater.

The meeting then proceeded to consider the resolution, which was as follows:—

> "This Association is of opinion that the time has arrived when the National Veterinary Association of Great Britain and Ireland should urge the Royal College of Veterinary Surgeons to make another effort to secure exemption for veterinary surgeons from serving on juries."

The PRESIDENT (Mr. W. D. Rees) read from the chair the following communication which he had received from Mr. Scott in support of the resolution:—

"The resolution standing in my name requires few words of mine to commend it to your favourable consideration and support. Several years ago the R.C.V.S. brought forward a bill with the object of obtaining exemption for veterinary surgeons from serving on juries, and, although the case made was a strong one, the bill was thrown out. Since then, I believe, no further official steps have been taken to remove this obvious injustice. The Medical Profession has long enjoyed the privilege of exemption, although we are as much entitled to it as they, for is it not a fact the S.O.S.'s we receive may be just as numerous and urgent? As the law stands to-day, the least busy of all medical men is free from service, while the hardest-worked veterinary practitioner, whose day is fully crowded with honest endeavour in the relief of animal suffering, is not. But there is another aspect which, as members of a learned profession, makes us deeply resentful, and that is this. The State, in failing to recognise our claims in this matter, casts a direct slur upon our *locus standi*.

The authorities cannot on any pretext urge that out of the ten million people in this country capable of serving on juries the exemption of some three thousand veterinary surgeons would make any difference to the jury list, especially when one remembers that with a stroke of the pen forty thousand medical men became exempt. Of course, if we are satisfied with our conditions and are content to lie low in the abyss of apathy, we cannot blame the powers that be if we are ignored.

If we want privileges we must fight for them, and we must rise to a man until we get them.

I confess it is a personal experience which has prompted me to bring forward this resolution. Until within a year ago I have never been asked to serve on a jury, and naturally I considered myself immune from such vexations. Notice to appear on a grand jury came as a rude shock. I saw the responsible authority, explained my position, and through him obtained his sympathetic support and an assurance that I would be exempt in the future.

This personal consideration, I need hardly say, was greatly appreciated by me, but we, as a body, want something more in this matter—we want exemption for every member of our profession, in the eye of the law, as a professional birthright, and we must fight on until we get it.

If you pass this resolution to-day, is it too much to ask other associations throughout the country to give their support also, so that the 'National' may approach the R.C.V.S. with a strong and influential hand."

The PRESIDENT: On behalf of Mr. Scott, I formally move this resolution.

Mr. J. C. COLEMAN: I beg to second the resolution, sir. I quite agree with Mr. Scott that it is necessary that we should all be legally recognised, but I think the majority of us have the same privilege granted to us that was accorded Mr Scott upon the occasion he mentions. I, too, was only called once, and that was 30 years ago, and I have not been approached since. But I think some such provision is necessary.

Mr. CLODE: I was refused exemption some years ago.

Mr. WILLIAMS: I was refused in March, and from a grand jury.

Mr. PERRY: I think we are unanimous in our opinion upon this question.

The PRESIDENT: It has been proposed and seconded that the resolution be passed and forwarded to the "National."

The resolution was carried unanimously.

NOTICE OF MOTION.

Mr. C. E. PERRY gave notice that, at the next meeting of the division, he would move:—

"That, in the opinion of this division, it is desirable that, when a member has upon the Order Paper a resolution standing in his name, he should be present to support it."

It was decided, after a brief discussion, that the next meeting of the division, to be held in January, should take place at Hereford.

The following new members were elected:—Messrs. R. R. I. Coleman, Swindon; T. H. Jones, Llandilo; C. W. Makinson, Swansea; and A. F. Good, Lampeter, Cards.

Before the meeting closed, the TREASURER rose to emphasise the desirability of altering the date of closure of the financial year from April to January, the Annual General Meeting to be held in that month. It was complicating matters considerably in regard to the collection of subscriptions to have their financial year ending in April, as in the case of some dilatory members it involved the payment of two years' subscriptions in one. The system was very difficult in its working.

The PRESIDENT: That would have to come up for consideration at our Annual General Meeting, when I should have much pleasure in seconding it.

The PRESIDENT: I think that we should record in our minutes that our best thanks are accorded to Mr. Barker (who is not with us, as his task was not completed in time to allow of his attendance) for his excellent, most instructive and truly painstaking demonstration for the benefit of this division this afternoon. (Applause.) As is usual with members who are asked to give demonstrations, Mr. Barker got a very hard case with which to deal. As a result, we are compelled to hold over the paper and discussion upon the subject of canker to our next meeting, to which I am sure we shall all look forward with pleasurable anticipation. (Hear, hear.)

The SECRETARY: I have very great pleasure in seconding, gentlemen. Knowing that Mr. Barker gave a very good paper to the "National" at York, I sought to secure his services for this division, and he willingly agreed to give this demonstration, right on top of the other.

The vote of thanks was carried with acclamation, and the meeting then terminated.

Those present were the guests of the Swansea members at a very substantial tea.

J. J. AVESTON, *Hon. Secretary.*

Notes and News.

The Editor will be glad to receive items of professional interest in these columns

NOTICE TO DIVISIONAL SECRETARIES.

The Editorial Committee, wishing to be of assistance to the divisions, and with a view to achieving uniformity in the reports of meetings, and acceleration in their publication in the *Record*, are prepared to send their representative to report their proceedings.

Will Secretaries of divisions, wishing to avail themselves of this offer, forward particulars as to dates, times, and places of meeting to the Editor, 12 Buckingham Palace Road, S.W.1., at least a month prior to such meetings, when the scale of charges will be forwarded to them?

Diary of Events.

Oct. 11th—Central Division, Annual General Meeting.
Oct. 12th—N.V.M.A. Editorial Committee Meeting, 12 Buckingham Palace Road, 5 p.m.
Oct. 18th—Probable date of Special Meeting of Council of R.C.V.S.
Southern Counties' Meeting at R.A.V. School, Aldershot.
Oct. 19th—N.V.M.A. Editorial Committee Meeting.
Oct. 26th—10 Red Lion Square secured for College headquarters, 1853.
Oct. 31st—Changes of address for 1924 Register to be sent to 10 Red Lion Square.

Mr. J. J. Lang, whose serious accident we reported recently, has now so far recovered that it has been possible to remove him to Brigg, where he remains in the local hospital. Unfortunately, we are sorry to say, Mrs. Lang is still in a serious condition, and it is not possible at present to take her also to Brigg.

* * * *

Owing to his appointment to the Chair of Animal Pathology at Cambridge, Professor J. B. Buxton has found it necessary to resign from the post of Joint Secretary to the Section of Comparative Medicine at the Royal Society of Medicine. He has recently received another honour at the hands of the Veterinary Profession, which will be announced shortly.

* * * *

This week we publish the report of the Mid-West and South Wales divisional meeting which took place the week before last. Considering that the proof had to be sent to the Secretary for final revision, we think this is an example of prompt work, and we hope other divisions will avail themselves of this useful service which the National is now able to provide.

* * * *

Amongst other visitors to the office recently was Captain H. E. Cross, who is home on extended leave. His work on Surra is well known, and he has been the means of saving many thousands of pounds to the Government, particularly in regard to losses in camels. We hope his work will not escape full recognition, as so often happens. Captain Cross, though no longer a young man, is considering completing his course for a medical degree.

The meeting of the Southern Counties Division, which is to be held at Aldershot on October 18th, promises to be one of exceptional interest, thanks to the invitation which has been received from Colonel A. J. Williams, Commandant of the R.A.V. School. The museum of the School contains many exhibits which those attending the meeting should not miss the opportunity of seeing, and an attractive feature of the proceedings will be Colonel Williams' demonstration on a horse with the X-ray apparatus recently installed. In addition, if time permits, Captain C. J. R. Lawrence will read a paper on vaccines and how they are made. Members are reminded that *post-mortem* specimens brought to the meeting will be much appreciated.

ROYAL SOCIETY OF MEDICINE.

Major F. T. G. Hobday was, on Tuesday, elected Secretary of the Section of Comparative Medicine of the Royal Society of Medicine, and Professor J. B. Buxton was elected in his place on the Council of that Section, the Secretary being on the Council *ex-officio*.

FOOT-AND-MOUTH DISEASE.

The existence of foot-and-mouth disease was, on Tuesday, confirmed on premises at Barnoldswick, West Riding of Yorkshire; at Adney, near Newport, Shropshire; and at Hedge End, near Southampton.

The first two outbreaks are in localities hitherto free from the disease, and the Ministry of Agriculture has issued Orders prohibiting the movement of cattle, sheep, goats and pigs in areas covering a radius of about 15 miles from the infected places concerned in these two outbreaks. The third case mentioned is in an area already subject to movement restrictions, but it has been deemed necessary to extend the scheduled area in this case.

An entirely new feature in their efforts to control foot-and-mouth disease was recently introduced by the Ministry of Agriculture, an order being made controlling dogs in prohibited areas. Dogs in scheduled areas must now be confined in a kennel or other enclosure, and any dog not kept under control the owner or person in charge shall be deemed guilty of an offence against the Act of 1894, which has been enforced for the first time.

The Ministry of Agriculture, in collaboration with the Agricultural Departments for Northern Ireland and the Irish Free State, are to adopt a system of ear-tagging Irish cattle that come into this country. The tagging will be done at the landing-places. The idea is to trace the place of origin of animals from Ireland which may subsequently be affected with or suspected of foot-and-mouth disease.

Correspondence.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.
All correspondence must bear the name and address of the contributor for publication.
The Editor does not hold himself responsible for the opinions of his correspondents.

Hæmorrhagic Septicæmia and Bracken Poisoning.

To the Editor of the Veterinary Record.

Sir,—It is very interesting to read the recent communications which have appeared in the *Record* under the above headings.

Capt. L. G. Maguire is apparently firmly convinced that the so-called cases of bracken poisoning are in reality cases of hæmorrhagic septicæmia, and he very frankly invites discussion as to whether there exists naturally such a condition as "bracken poisoning."

It is really very difficult to believe that bracken itself can produce the symptoms—both *ante-mortem* and *post-mortem*—attributable to it, when one thinks of the large number of ruminants that feed on it every year—both in the green and dry state.

One writer stated that it only produced disease when used as bedding, and eaten in the dry state. Now, assuming that these symptoms are produced by bracken—this statement is not correct, for the first outbreak (which I also personally saw) referred to by my neighbour and colleague, Mr. R. P. Jones, of Ruthin, in the *Record* dated 15th September, was due to the animals eating young and green bracken. That, to me, is sufficient proof—still assuming that there is such a thing as bracken poisoning—that it makes no difference whether the bracken is green or dry.

As Capt. Maguire points out, if these symptoms are due to bracken, how is it that in some instances symptoms appear three weeks after the animals have last partaken of bracken?

It is not feasible to think that the "poison" can exist in the system for three weeks without producing symptoms, and that, when they do appear, they should be so acute and fatal.

I would, however, like to ask Capt. Maguire whether or not similar cases appeared annually on those farms prior to the adoption of preventative vaccination?

Usually these so-called outbreaks of bracken poisoning are of a sporadic nature—they have, perhaps, never been seen or heard of before on the farm, and will not make an appearance again for years, though ruminants graze every year on the same land. I suggest to Capt. Maguire that he abandons the vaccination treatment for two or three or more years, on *some* of those farms, for, should cases then appear, it will greatly strengthen his argument, and will go very far to prove to us that these outbreaks are really those of hæmorrhagic septicæmia.

This, however, would entail careful manipulation of the owner—he could be told frankly what the defect is, or Capt. Maguire can tactfully discover some other way of carrying out this suggestion should he consider it worth while.—Yours truly, H. Llewelyn-Jones, Denbigh.

25th September, 1923.

To the Editor of the Veterinary Record.

Sir,—I have read with interest Capt. L. G. Maguire's article in your issue of September 22nd.

Can Capt. Maguire explain why hæmorrhagic septicæmia attacks only cattle that have access to bracken? These cattle, moreover, have the stomach gorged with the fern on *post-mortem*.

I had a number of deaths just lately, the animals showing exactly similar symptoms to those on which I reported in 1919. In this outbreak also the animals continued to die a week or two after being removed from the bracken.

It would be interesting to learn from Capt. Maguire the connection between the ingestion of bracken and hæmorrhagic septicæmia.—Yours truly, John Brown, Invergordon.

September 24th, 1923.

To the Editor of the Veterinary Record.

Sir,—Apropos of this disease and the recent correspondence thereon, if those interested would refer to any of the works of literature enumerated hereunder,* they will find much useful and instructive information bearing on the subject. The disease is present extensively in America, and probably to a lesser degree in Canada. At the time of the recent legislation for the re-admission of Canadian cattle to Britain, it struck one that, had this fact been known by those who were opposed to the measure, it might have been used by them in their arguments as a point for the continued exclusion of foreign store cattle.

In Ireland within the past three years the writer has seen three outbreaks amongst cattle. In one of these there were predisposing circumstances—namely, castration and a long rail journey. The cases occurred in October and January.

Anti-hæmorrhagic septicæmia serum has already proved of great service in treatment. The weight of evidence, from America, seems to suggest that bacterins should only be administered with caution to those affected or already exposed to infection, and preferably then only after a primary immunising dose of anti-hæmorrhagic septicæmia serum.—Yours truly, L. J. Kelly, F.R.C.V.S.

* Hæmorrhagic septicæmia of Cattle.—*Amer. Jour. of Veterinary Medicine*, November, 1919.
Prevention of "Stockyard Pneumonia" (hæmorrhagic septicæmia).—*Veterinary Medicine*, March, 1922.
An Outbreak of Hæmorrhagic Septicæmia amongst Sheep. (H. Preston Hopkins—*Amer. Jour. of Veterinary Medicine*, May, 1919, p. 218, *et seq.*).
Hæmorrhagic Septicæmia amongst Sheep in Colorado. (J. Newsom—*Amer. Jour. of Veterinary Medicine*, July, 1919, p. 371, *et seq.*).
Hæmorrhagic Septicæmia in Sheep. (J. Newsom—*Amer. Jour. of Veterinary Medicine*, February, 1920, p. 47, *et seq.*).
Immunization against Hæmorr. Septicæmia. (J. R. Mobler—*Jour. of Amer. Veterinary Medical Association*, September, 1923, p. 76, *et seq.*).
Biological Therapeutics in Bovine Hæmorrhagic Septicæmia and Equine Influenza. (W. P. Bossenberger—*Jour. Amer. Veterinary Medical Association*, July, 1923, p. 464, *et seq.*).
Hæmorrhagic Septicæmia in Mules. (H. R. Church and E. L. Stubbs—*Jour. Amer. Veterinary Medical Association*, August, 1923, p. 624, *et seq.*).
An Outbreak of Hæmorr. Septicæmia among Sheep. J. Newsom and Floyd Cross—*Jour. Amer. Veterinary Medical Association*, March, 1923, p. 759, *et seq.*).

To the Editor of the Veterinary Record.

Sir,—In the *Veterinary Record* dated the 15th September, Capt. W. F. Aston advanced the theory that the outbreaks of disease such as I described in the same issue under the term bracken poisoning were actually cases of hæmorrhagic septicæmia, and that poisoning by bracken, when it does occur, is due to the consumption of it in a *dried* state, and that the fern, in the green condition only, is the third factor in the bacterial disease hæmorrhagic septicæmia.

Whilst not denying that the symptoms both *ante* and *post-mortem* were consistent with the specific disease, there are certain facts which to me lend weight to the view that either the fern or tormentil is involved in producing the toxic effect.

In my experience, the disease appears amongst animals eating both green (outbreaks 1 and 3) and dried bracken (outbreak 2). Blood smears, and smears taken from the prescapular lymphatic glands of the infected animals during life, and from the spleen, liver, and other organs after death, were examined by Messrs. Wynne and Llewelyn-Jones and myself, and proved negative. Similar smears submitted to the Ministry of Agriculture were reported upon as negative.

I understand that in acute stages the organism is found in great numbers in the blood. It should, therefore, not have escaped our notice. The incubative period of hæmorrhagic septicæmia is, I believe, 24 to 48 hours. Yet, if the fern be the "third factor," how is it that no clinical symptoms in certain outbreaks can be appreciated for intervals varying from two to six weeks after removal of the animals from land on which the weed grows ?

Again, Capt. Aston states that sera are particularly useful in controlling the diseases, yet, owing to our doubtful diagnosis in the first outbreak, serum was obtained from Messrs. Parke, Davis and Co., and injected in generous quantities into all the animals involved. It failed, however, to influence the course of the disease beneficially.

I was lucky enough to have a short, but unfortunately incomplete, conversation with Capt. Aston on this subject. I understood that in the outbreaks with which he has dealt his diagnosis has been corroborated by bacteriological examination—that the *Pasteurella bovis* was found in the smears. I would welcome, and I am sure other of your readers, judging by the numerous recent notes on this subject, would be equally glad, to have from him further particulars concerning this point. This complaint is now apparently becoming a prevalent one and deserving investigation.

To me the term bracken poisoning for the disease is just as unsatisfactory as hæmorrhagic septicæmia. If it be a plant poison, which are we to incriminate—bracken or tormentil ? If a disease, which organism is responsible ? Whatever it be, bracken appears to be an important factor in its production.—Yours truly, R. P. JONES.

Holland House, Ruthin,
September 19th, 1923.

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—Through the courtesy of Captain Maguire, I have been able to examine a smear made from a culture which was originally grown from the heart-blood of a calf.

There is no doubt that the micro-organisms present on this slide are pasteurella and undistinguishable from the *Bacillus bovisepticus*, which we believe to be the cause of hæmorrhagic septicæmia. In appearance and staining they are identical with the pasteurella which I have observed in many hundreds of cases in Africa.

Until I had examined this slide I was very sceptical as to the existence of hæmorrhagic septicæmia in England, as I have made many slides from animals that have died after a short and suspicious illness, but have never been successful in finding the organism for which I was looking. If any reader possesses any smears from cases which are suspicious of hæmorrhagic septicæmia, I should be very grateful to be allowed to examine them—unstained smears preferred.—Yours truly, FRANK CHAMBERS, Major, O.B.E., F.R.C.V.S.

4 Market Street, Wolverhampton.

Mr. Hudson's York Operation.

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—I am pleased to report that the Clydesdale gelding, so ably operated upon by Mr. Hudson, Retford, at the recent meeting of the N.V.M.A. at York, for scrotal hernia, has made a splendid recovery. The operation was described in the *Veterinary Record*, September 8th, 1923.—Yours truly, J. W. RIDER, Ravenscroft, Beamish.

September 26th, 1923.

MARKING OF IRISH ANIMALS.

The Minister of Agriculture has made a new Order, dated September 14th, with regard to the marking of animals brought from Ireland. The previous Order on the same subject is revoked. The new Order, which is described as the Irish Animals (Marking) Order of 1923 (No. 2), and comes into operation on October 1st, is as follows :—

1.—(1) Cattle brought from Ireland shall not be moved from a reception lair in a landing-place approved by the Minister for the purposes of the Animals (Landing from Ireland, Channel Islands, and Isle of Man) Order of 1923, unless and until the cattle have been marked at the expense of the owner or his agent in the following manner, namely :—By fixing to the left ear of each cattle a numbered tag of a pattern approved by the Ministry and supplied by the occupiers of the landing-place. The charge for such tags and, when necessary, fixing the same by the occupiers of the landing-place shall be approved by the Minister of Agriculture and Fisheries.

(2) A licence for the movement of cattle out of the landing-place shall not be granted unless and until the cattle have been marked in accordance with this Order.

(3) Sheep, goats or swine brought from Ireland shall not be landed in Great Britain unless the animals have been marked by and at the expense of the owner or his agent in the following manner, namely :—By the painting or stamping with a red adhesive composition of a broad line down the back and another broad line across the loins, thus +, each line being not less than nine inches long.

(4) If any person shall efface, obliterate or remove, or attempt to efface, obliterate or remove, any mark on an animal while such animal is subject to the provisions of this Order or of the Animals (Landing from Ireland, Channel Islands, and Isle of Man) Order of 1923, he shall be deemed guilty of an offence against the Act of 1894.—*The Times*.

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Dublin Appointment.

The Finance and General Purposes Committee have recommended to Dublin Corporation the appointment of Mr. J. M. Murphy, V.S., to the permanent staff as Assistant Veterinary Inspector at a salary of £525, rising by annual increments of £25 to a maximum of £750.

A cure for anthrax has been reported to Fife County Council. Mr. David Lees instanced a number of cases where cattle with temperatures of 107 and 108 degrees had been treated with a mixture prepared by a Cupar authority and had recovered. It was stated that a dose cost 1s. 6d., and instructions were given to issue a supply of the mixture at the expense of the County Council.

Diseases of Animals Acts, 1894 to 1914. Summary of Returns.

Period.	Rabies. Cases Confirmed. Dogs.	Rabies. Cases Confirmed. Other Animals.	Anthrax. Outbreaks confirmed.	Anthrax. Animals attacked.	Foot-and-Mouth Disease. Outbreaks confirmed.	Foot-and-Mouth Disease. Animals slaughtered or diseased or exposed to infection.	Glanders (including Farcy).* Outbreaks reported by the Local Authorities.	Glanders (including Farcy).* Animals attacked.	Parasitic Mange.* Outbreaks reported by the Local Authorities.	Parasitic Mange.* Animals attacked.	Sheep Scab. Outbreaks reported by the Local Authorities.	Swine Fever. Outbreaks confirmed.	Swine Fever. Swine slaughtered as diseased or exposed to infection
GT. BRITAIN.													
Week ended 8th Sept., 1923	..	...	18	22	19	339	1	4	10	15	4	32	9
Corresponding Week in 1922	...	...	4	4	...	...	...	...	11	12	5	22	7
Corresponding Week in 1921	...	...	5	5	...	...	1	2	23	29	2	18	10
Corresponding Week in 1920	2	..	6	12	...	...	...	...	37	40	1	17	10
Total for 36 weeks, 1923 .	...	...	504	580	59	2070	6	11	652	932	364	1339	571
Corresponding period in 1922	1	...	366	424	1125	54940	2	2	851	1214	426	849	329
Corresponding period in 1921	22	1	368	474	43	2958	10	30	1788	2711	408	891	311
Corresponding period in 1920	10	...	295	358	72	9632	10	17	3016	5044	295	1430	567
GT. BRITAIN.													
Week ended 15th Sept., 1923...	...	...	15	19	23	2780	...	...	12	16	2	38	28
Corresponding Week in 1922	...	...	5	5	...	..	...	...	5	11	5	29	8
Corresponding Week in 1921	...	...	3	7	...	...	...	..	23	30	2	14	4
Corresponding Week in 1920	3	...	10	11	...	...	...	...	38	44	9	27	13
Total for 37 weeks, 1923 ...	...	...	519	599	82	4850	6	11	664	948	366	1377	599
Corresponding period in 1922	1	...	371	429	1125	54940	2	2	856	1225	431	878	337
Corresponding period in 1921	22	1	371	481	43	2958	10	30	1791	2741	410	905	315
Corresponding period in 1920	13	...	305	369	72	9632	10	17	3054	5088	304	1457	580

Note.– The figures for the current year are approximate only. *Excluding outbreaks in Army horses.

IRELAND.									Outbreaks			
Week ended 1st Sept., 1923 ...	...	...	...	..	...	...	...	3	...	6
Corresponding Week in 1922 ...	...	...	...	...	...	...	1	...	7	33
Corresponding Week in 1921 ...	...	...	...	..	...	...	1	4	1	26
Corresponding Week in 1920 ...	...	...	...	...	...	..	1	8	...	...
Total for 35 weeks, 1923	...	...	...	...	..	..	63	94	100	698
Corresponding period in 1922 ...	1	1	...	...	...	...	68	145	173	945
Corresponding period in 1921 ...	...	...	7	7	.	...	68	183	79	425
Corresponding period in 1920 ...	1	1	...	...	1	3	83	195	8	25
IRELAND.									Outbreaks			
Week ended 8th Sept., 1923 ...	...	...	..	...	..	...	...	1	1	5
Corresponding Week in 1922 ...	...	...	...	...	...	...	...	4	1	12
Corresponding Week in 1921 ...	...	...	...	...	..	..	...	6	3	10
Corresponding Week in 1920 ...	...	...	...	...	...	...	...	7	...	...
Total for 36 weeks, 1923	...	...	...	...	...	...	64	95	101	703
Corresponding period in 1922 ..	1	1	...	...	...	..	68	149	174	957
Corresponding period in 1921 ...	...	...	7	77	...	...	68	189	82	435
Corresponding period in 1920 ...	1	1	...	...	1	3	84	202	8	25

Note.—The figures for the current year are approximate only.